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COMMERCIAL FISHERIES REVIEW

Vol. 9, No. 5 MAY 1947

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UNITED STATES
DEPARTMENT OF THE INTERIOR
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COMMERCIAL FISHERIES REVIEW

A REVIEW OF DEVELOPMENTS AND NEWS OF THE FISHERY INDUSTRIES
PREPARED IN THE DIVISION OF COMMERCIAL FISHERIES

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COMMERCIAL FISHERIES REVIEW

May 1947 Washington 25, D.C. Vol. 9, No.5

MOBILE LABORATORIES FOR FISHERY TECHNOLOGICAL RESEARCH

By C. E. Winter* and L. A. Sandholzer*

ABSTRACT

Much of the work of fishery technology must be performed in the field. Establishment of temporary, efficient, field laboratories has not always been possible.

The mobile unit described in this article has been tested under a variety of conditions. The results have been so satisfactory that non-governmental organizations which have investigated its performance have ordered similar units.

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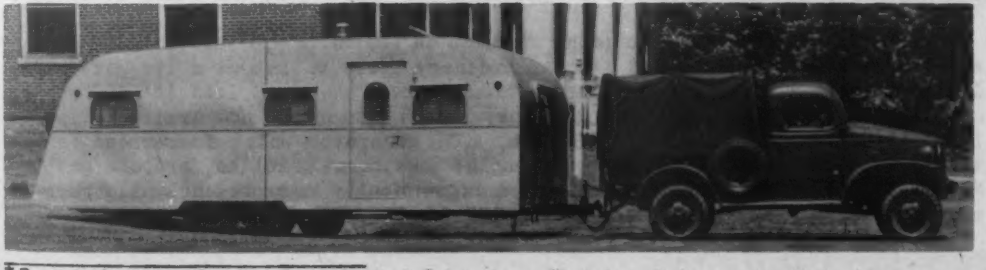
Because problems in fishery technology frequently lend themselves to study only in the field, there has been a growing need for increased laboratory facilities in fishery areas to meet the needs of the industry. The establishment of temporary field stations has not always been entirely satisfactory. The laboratory set-up in such situations is nearly always makeshift; the equipment must be dismantled, packed, and shipped to the next station as the site of work is changed. Continual transportation leads to excessive breakage, and possible loss of expensive scientific instruments, and the physical facilities are frequently unsuited to the type of investigation to be made. In some instances where better facilities have been unavailable, technologists of the Division of Commercial Fisheries have worked in temporary quarters where the tide regularly rose 6 to 10 inches above the floor; where rain and snow became integral parts of the investigation; and where insects and rodents pried into the test tubes and fed on the bacteriological cultures.

Although it is possible to work under inadequate conditions, efficient operation is not obtained. Frequently, as much time had to be spent in maintaining the field station as was devoted to actual investigation. To overcome these disadvantages and to improve its service to the industry, the Technological Section of the Division of Commercial Fisheries designed and equipped three trailer laboratories. At present, they are based at College Park, Md.; Boston, Mass.; and Seattle, Wash. These mobile units have proved to be very satisfactory and are so superior to the usual makeshift arrangements that at least one organization has



*Bacteriologists, Fishery Technological Laboratory, Division of Commercial Fisheries, College Park, Maryland.

built a similar unit patterned after the trailer equipped at the Division's Fishery Technological Laboratory at College Park, Md. Requests from other organizations indicate that there is a need for a complete description of the latter laboratory.

The detailed information presented hereafter concerns the mobile unit assigned to the College Park Laboratory. The laboratory is housed in a four-wheel, house-type trailer and is pulled by a four-wheel-drive, half-ton truck. It is equipped for bacteriological, chemical, and technological investigations and can rely on its own water, gas, and electric supplies, if necessary, so that it can be used anywhere a commercial fisheries problem may arise.

To date, the trailer laboratory has been used in investigations in regions from Massachusetts to Virginia. The outside temperatures encountered have ranged from minus 5° up to 96° F., and no difficulty has been found in operating under these varied conditions. The problems studied have ranged from those of research to large-scale routine determinations, and crews have ranged from one to six men. The unit has proved to be so flexible that there are very few technological problems which can not be handled on a laboratory scale.

Figure 1 shows the general plan. The trailer has an over-all length of 24 feet and an over-all width of 8 feet and is divided into two compartments. Fitted cabinets, drawers, and work benches were built to specifications. The work benches can accommodate three persons comfortably. Adequate storage space is provided for all loose equipment. There are three roof-ventilators and eight windows. Two sets of screened and tight doors lead to the outside.

The plumbing installations consist of two 30-gallon galvanized water tanks, one 25-gallon copper-alloy tank for distilled water, and two sinks, each with two faucets and a drain. The water tanks are located in the forward ceiling cabinet and are filled through a hose connection at the front of the trailer. When a convenient water source is available, this same connection is used to supply water directly to the cold-water taps on the sinks. The hot-water taps are connected to a second hose coupling, which is used when hot water is available from the outside. The storage tanks are filled only when water is unavailable on location or in winter when a constant hose connection would freeze. The sink drains are connected to a common outlet to permit sullage to be carried to a sewer or away from the trailer by a hose. The distilled water tank is installed in the ceiling cabinet above the small sink. It is filled through an inlet on the outside of the trailer, and the water is delivered through a special valve located over the sink. The large sink in the forward part of the trailer is equipped with a stainless-steel drain board. A peg board is built over the sink for the draining of flasks, beakers, etc.

The Bunsen burners, stove, and autoclave are connected to two 60-pound tanks of propane gas. These tanks are located under the work bench in the forward right corner and are equipped with a pressure gauge and an automatic change-over valve which permits the exhaustion of the gas from one tank before the other is opened.

All of the electrical equipment operates on 110 volts A.C. so that, if available, current can be supplied from an ordinary house outlet on a two-wire cord. In the selection of equipment, care was taken to keep the total load to 1500 watts, or less, to prevent overloading the line. Where current is not available, power is obtained from a 1500-watt, 110-volt, A.C. generator which is carried on the truck. The generator is driven by an engine that burns gasoline, propane gas, or No. 2 fuel oil, and which starts and stops automatically in accordance with current requirements.

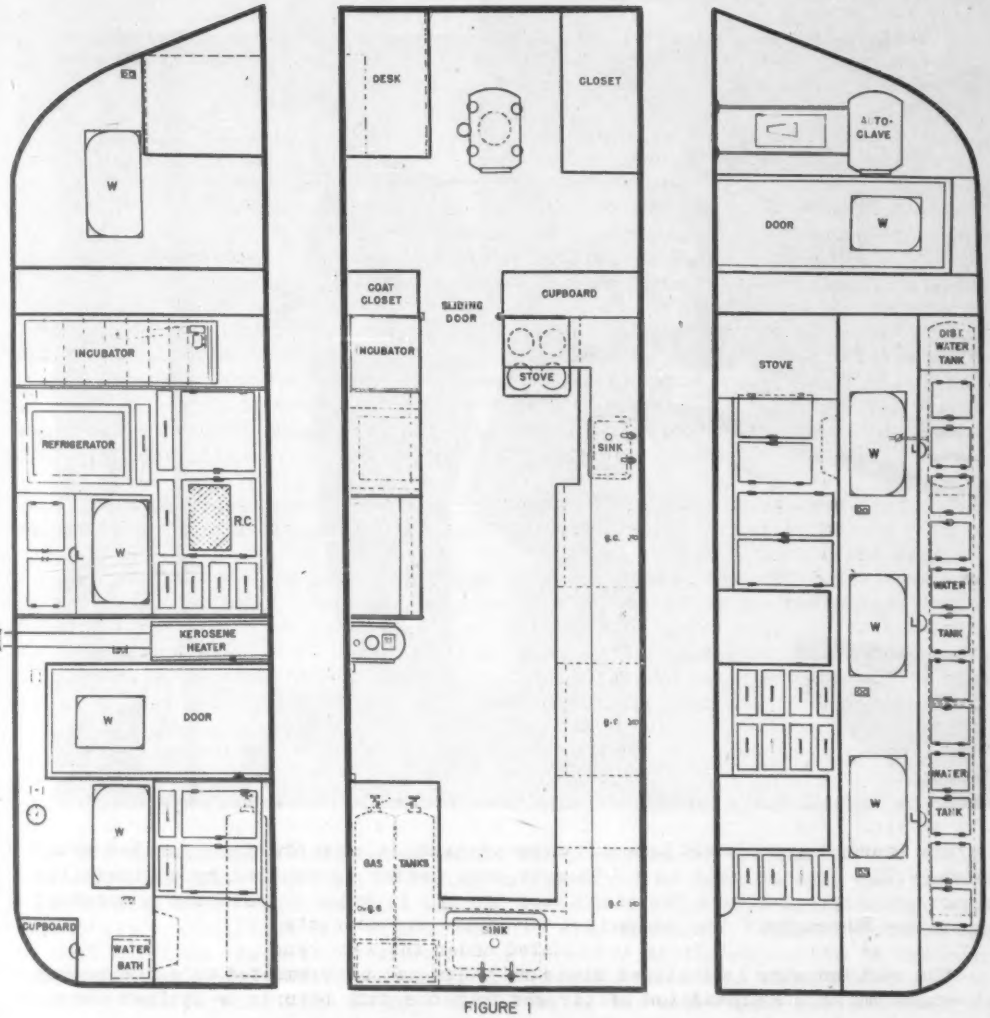


FIGURE 1

OVER-ALL LENGTH INSIDE--23 ft. 8 in.; WIDTH--7 ft. 3 in.
LEGEND: g.c.-GAS COCK W-WINDOW L-LIGHT R.C.-REFRIGERATOR COMPRESSOR

The electrical installations consist of six double-outlet wall plugs above the work benches; five "spot" lights above the benches; three fluorescent ceiling lights; an electric refrigerator; automatic controls on the autoclave; a 37° C. incubator; a heater fan; and certain other scientific equipment such as a Waring blendor, microscope lamp, water bath, etc. These latter items are used only intermittently for short periods of time.

The incubator is a cellotex-insulated cabinet with five perforated metal shelves. The heating unit is a 250-watt oven heater controlled by a bimetallic thermoregulator. A blower fan circulates the air in order to maintain a constant temperature throughout the cabinet.

The refrigerator is equipped with a shelf-freeze unit connected to a compressor and condenser unit mounted behind a perforated metal door in a cabinet below.

The four plate burners of an apartment-size gas range are used for the preparation of culture media. The oven, which is equipped with an accurate temperature control, has adequate capacity for the sterilization needs of the unit and has proved to be very satisfactory for this purpose.

The autoclave is double-jacketed, heated with gas, and electrically controlled. It is equipped with a water-level safety valve, pressure control switch, air ex-

STERILIZING MEDIA

EXAMINING CULTURES

haust valve, and the usual pressure and temperature gauges. All of this equipment is fully automatic.

The trailer is heated with the usual type of fuel oil stove. An electric fan is used for circulating the heat.

In addition to the above permanent installations, the following equipment is stored in cabinets, drawers, or in special compartments on the benches:

BECKMAN pH METER
QUEBEC "DARK-FIELD" COLONY COUNTER
CONSTANT-TEMPERATURE WATER BATH
WARING BLENDOR AND SUPPLY OF CONTAINERS
TRIPLE-BEAM BALANCE
FIRE EXTINGUISHERS
CLOCK
INTERVAL TIMER
FAN
BOTTOM-WATER SAMPLER
MUD DREDGE
RUBBER HOSE
ELECTRIC CORDS
SHOVEL
AXE
FLARES AND EMERGENCY LIGHTS
ROPE AND TOW CABLE
LABORATORY GLASSWARE, THERMOMETERS, ETC.

The cabinet space in the rear compartment is used for storage of the field-sampling equipment, hose, etc. A clothes closet and a cupboard with shelves are also located here. The cupboard is used for the storage of sterile media, cultures, etc. A built-in desk with drawers is also available. The compartment can be shut off from the main workroom. The location of the autoclave in the rear compartment makes it possible to keep the laboratory working compartment cool in summer if the sliding door is kept closed while the sterilizer is in operation.

With very little additional equipment, the usefulness of the unit can be expanded. For experimental canning, for instance, a can sealer could easily be mounted on one of the work benches. For chemistry, only the necessary glassware and reagents would be required.

In addition to purely investigative activities, the unit has been used for educational purposes. Exhibits have been arranged on the benches, visitors en-

tering by the forward door and leaving by the rear. The portable power plant makes it possible to show movies on fish cookery or industrial practices in areas where such facilities do not exist at present. The laboratory can also be used for fish-cookery demonstrations to small groups.

The successful use of the mobile unit, thus far, indicates that trailers of this sort can serve as practical and effective auxiliary arms to the permanently established laboratories. This has been realized to a limited extent by this and other agencies which usually have equipped units on a restricted basis for specialized jobs. The trailer described here is an "all-purpose" laboratory unit designed to enable the Fish and Wildlife Service to give a variety of effective aid to the fishery industries.

FISHERIES EDUCATION AND RESEARCH IN JAPAN

In keeping with the importance of fish and marine products in the general economy of Japan, the Japanese Government has placed much emphasis on fishery education and fisheries research, both biological and technological.

Japan has 32 prefectural fisheries schools in 24 prefectures. These schools give special training in the biology of fishes and chemistry of marine products as well as technical and practical training in fishing, fish processing, navigation, boat building, and allied subjects. The schools are designed to train men to be expert fishermen, and cannery managers. Graduates from the prefectural fisheries schools are eligible to enter the two fisheries colleges, one of which is at Hakodate, Hokkaido, and the other at Tokyo. The colleges offer three- and five-year courses in fisheries. Three of the seven Imperial universities in Japan have fisheries departments in their faculties of agriculture. The departments offer a three-year course leading to a college degree. This is the highest level of fisheries education in Japan. Japan has 118 Government-supported fisheries and marine products research stations and branches. Six are operated by the Government and 112 by prefectures. These stations conduct research in fisheries biology, fishing methods, and fisheries products.

--Fishery Leaflet 236

STUDIES ON DETERIORATION OF VITAMIN A IN FISH LIVERS AND LIVER OILS [1]

PART II - LOSS OF VITAMIN A POTENCY AND STABILITY IN FROZEN GROUND GRAYFISH LIVERS

By D. Miyauchi* and F. B. Sanford*

ABSTRACT

There was no appreciable loss of vitamin A in grayfish livers stored for as long as 41 weeks at about -22.5° C. The free fatty acid content increased slightly, and the relative stability of vitamin A decreased about 50 percent at 27 weeks in storage.

- - - - -

In a previous experiment [2] ground grayfish liver samples [3] stored from 4 to 7 weeks under three different conditions--room temperature (23° C.), in ice (0° C.), and in frozen storage (-22.5° C.)--were tested at varying intervals. These tests showed no significant change in the vitamin A potency, but with increase in temperature of storage the free fatty acid content tended to rise and the vitamin A stability decreased rapidly. Further tests were made on the liver samples held up to 41 weeks in frozen storage. In this paper, the results of these additional tests are combined with the data accumulated from the tests conducted on the livers held in frozen storage in the previous experiment mentioned above.

SAMPLING LIVERS

After storage in the frozen state had continued for periods of 3, 7, 27, and 41 weeks, two or three samples of ground grayfish livers were removed from the freezer, thawed, and analyzed for their vitamin A and oil contents (Table 1). Each sample was analyzed in replicate, and the average vitamin A potency for each sample was calculated from these replicate analyses. The differences in the vitamin A potencies of the replicates for any one sample indicate the variation occurring in the method of analysis, while the differences between the average potencies for each of the several samples show the variation involved in the analytical and the sampling processes. A statistical analysis of these data showed that the difference in vitamin A potency of the oil from the fresh livers and of that from the livers stored 41 weeks is without significance.

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1/ This is one part of a series of articles on this subject. Part I appeared in the February 1947 issue and Part III in the March 1947 issue of Commercial Fisheries Review. Also available as Separate Nos. 167 and 170, respectively.

2/ F. B. Sanford, D. Miyauchi, and G. I. Jones. Part I - Loss of Vitamin A and Stability in Grayfish Livers in Storage. Commercial Fisheries Review, February 1947, pp. 11-15.

3/ The samples of ground grayfish were obtained as follows: Approximately 30 pounds of grayfish livers were passed through a meat grinder, stirred until homogeneous, filled into pint Mason jars to within one-half to one inch of the top, and then covered.

Ratios of the E values at various wave lengths between 300 and 350 mmu. to the E value at 328 mmu. are given in Table 2. The results indicate that during

Table 1 - Analyses of Ground Grayfish Livers Stored in Refrigerator at an Average Temperature of -22.5° C. (-8.5° F.)[1]

Storage Period	Replicate	Oil Content of Liver Sample[2]	Free Fatty Acid in Liver Oil[3]	Vitamin A Potency of Liver Oil[4]				Relative Vit. A Stability of Liver Oil[5]
				Sample 1	Sample 2	Sample 3	Average	
Weeks	Number	Percent by Weight	Percent as Oleic Acid	USP Units Per Gram	USP Units Per Gram	USP Units Per Gram	USP Units Per Gram	Hours for 50% Decomposition
0	1	-	-	14,792	14,209	-	-	17.1
	2	-	-	14,332	13,973	-	-	18.0
	3	-	-	13,968	14,019	-	-	-
	Average	73.52	0.15	14,364	14,067	-	14,215	17.55
3	1	-	-	14,449	14,393	14,319	-	15.73
	2	-	-	14,417	14,313	14,246	-	15.80
	Average	72.41	0.17	14,433	14,353	14,282	14,356	15.76
7	1	-	-	14,605	14,385	-	-	16.4
	2	-	-	14,380	14,225	-	-	16.9
	Average	72.59	0.14	14,492	14,305	-	14,398	16.65
27	1	-	-	14,012	14,128	-	-	8.15
	2	-	-	13,978	14,141	-	-	8.45
	3	-	-	-	-	-	-	8.85
	Average	72.79	0.18	13,995	14,135	-	14,065	8.48
41	1	-	-	13,781	14,089	14,216	-	7.47
	2	-	-	13,880	14,206	14,258	-	7.49
	3	-	-	13,971	14,252	14,392	-	-
	Average	72.96	0.28	13,877	14,182	14,289	14,116	7.48

1/ Temperature ranged from -28° C. to -20° C. with -22.5° C. as the average.
2/ Oil was obtained by simple solvent extraction using petroleum ether.
3/ The tests were made on water-extracted oil using the method of analysis of the AOAC.
4/ Vitamin A potency was determined by the ultraviolet absorption method using the Beckman spectrophotometer. The values listed under Samples 1, 2 and 3 are values obtained in replicate for 12 different samples. Sample 1 merely designates the first sample chosen at random and analyzed at the end of a test period, and Sample 2, the second sample analyzed, etc.
5/ Oil was obtained by the water-extraction method.

the test period no appreciable amount of any substance was formed that could increase the extraneous absorption and thus change the E value ratios. Oser, et al,[4] have shown that the validity of the spectrophotometric estimate based upon E_{328} may

Table 2 - E Value Ratios for Oils Extracted from Ground Grayfish Livers at the End of the Storage Period[1]

Storage Period	Extinction Ratio D_λ / D_{328} for Wave Lengths in mmu. (λ)						
	300	310	320	325	330	340	350
Weeks							
0	0.667	0.842	0.972	0.991	0.980	0.806	0.570
3	0.653	0.847	0.955	0.998	0.978	0.813	0.560
41	0.678	0.844	0.961	1.003	0.983	0.813	0.570

1/ Oil obtained by simple solvent extraction using petroleum ether.

be in question when the ratio E_{300}/E_{328} exceeds 0.72. Since the E value ratios E_{300}/E_{328} in Table 2 are lower than 0.72 and have changed but little during the storage time of the livers, it is unlikely that a drop in vitamin A potency was masked by increased extraneous absorption at 328 mm.

4/ Determination of Vitamin A. B. L. Oser, D. Melnick, M. Pader, R. Roth, and M. Oser. Ind. & Eng. Chem., 17 pp. 559-62 (September 1945).

The average free fatty acid varied only slightly in the oils extracted from livers stored as long as 27 weeks in the freezer. In the oil extracted from livers stored 41 weeks in the freezer, the average free fatty acid increased from 0.15 percent to 0.28 percent. This amount of free fatty acid is small in comparison with the average free fatty acid of 0.68 percent for the oil from livers stored 4 weeks at room temperature.

The vitamin A stability tests were made as follows:5/ Air, at the rate of 350 ml. per minute, was passed through 15 ml. of the liver oil held at a temperature of 100° C. in a bubbling tube. At the beginning of the test period and periodically thereafter, samples of approximately 0.15 grams of oil were taken for vitamin A analysis. The time taken for 50 percent decomposition of the original amount of vitamin A in the liver oil under these conditions was used as the measure of relative stability. The decrease in the relative stability of the vitamin A oil from livers examined after 7 weeks of storage was small. However, after 27 weeks of storage the decrease in stability was about 52 percent, and after 41 weeks the decrease was about 57 percent. Several changes could be responsible for this pronounced loss of stability. It is possible that the anti-oxidants present in the liver are destroyed, that pro-oxidants are formed, or that some other combination of factors is involved under this condition of storage.

The stability of vitamin A oils extracted commercially, such as by the alkali digestion method, may be affected differently from that of water-extracted oil used in this experiment. Because the commercial extraction method may diminish the stability of vitamin A oils rendered even from fresh livers, the conclusion on vitamin A stability given in this paper may be non-indicative for commercially-produced liver oils.

In summary, the results of the experiment indicate that there is no appreciable loss, if any, of the vitamin A in grayfish livers stored as long as 41 weeks at an average temperature of -22.5° C., but that the free fatty acid content increased slightly and the relative vitamin A stability decreased over 50 percent at 27 weeks of storage.

5/F. B. Sanford, R. W. Harrison, and M. E. Stansby. A Rapid Test for Vitamin A Stability. Commercial Fisheries Review, March 1946, pp. 16-18. Also F.L. 212.

DEHYDRATION OF FISHERY PRODUCTS

Tests conducted by the Technological Laboratories of the U. S. Fish and Wildlife Service indicate that dehydration of fish is a relatively simple process yielding a product of good palatability. Successful storage, however, is difficult to attain. Furthermore, cost of the dehydrated product is high, perhaps too high for commercial production for domestic markets.

--Fishery Leaflet 120

NEW TYPE THERMOCOUPLE SEAL FOR TIN CONTAINERS

By M. Heerdt, Jr.,* F. Hoyos,** and M. Cantillo**

To determine accurately the rate of heat penetration during the processing of canned foods it is necessary to seal the thermocouple into the can. This may be accomplished with the use of special equipment described by Bigelow, Bohart, Richardson, and Ball (1920).

The specialized fittings of Bigelow, et al, have been simplified and improved in recent years.1/ This improved equipment now in general use consists of the following:

1. A flanged tube which has both internal and external threads
2. Two composition rubber gaskets
3. A lock nut
4. A special threaded bakelite thermocouple with plug receptacle

In practice, the gasketed flanged tube is inserted into a 1/2-inch diameter hole in the side of the can, the second gasket and the lock nut are threaded onto the outer or protruding portion of the tube until tight, and the bakelite thermocouple is threaded into this aforementioned tube or bushing. The result is a convenient vacuum-tight thermocouple seal that can be installed in a very few minutes.

Prepared thermocouple sealing equipment should be used for this purpose; however, it is not always available. Another procedure was devised to solve the problem of sealing a glass or metal thermocouple tube into a tin container when the prepared equipment was lacking. This alternate method was achieved with tools

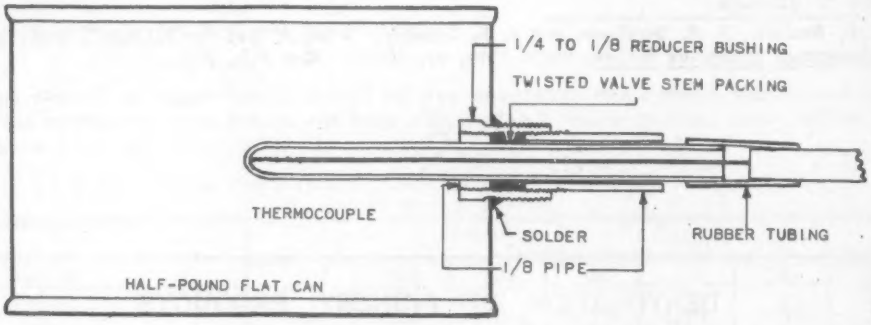

FIGURE 1 - METHOD USED TO SEAL THERMOCOUPLE

and equipment commonly found in the laboratory or pilot plant workshop. Figure 1 is a diagram of this simple method of producing a glass or metal thermocouple tube seal without special fittings.

Directions for making the seal are as follows:

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**American Republics Fishery Trainees.
1/See References Cited

Prepare a 1/4-to 1/8-inch pipe reducer bushing by tapping and threading the small end to receive a 1-inch length of 1/8-inch pipe. Thread another short length of 1/8-inch pipe into the opposite or reducer end of this bushing and cut it off flush with the hexagonal face as shown in Figure 1. Both short lengths of 1/8-inch pipe should be reamed with a round file to accommodate the 6-millimeter outside diameter glass or metal thermocouple tube. Drill a 1/2-inch diameter hole into the side of the can with the aid of a drill press and insert and solder this prepared reducer bushing into the hole in the can so that the hexagonally shaped shoulder remains inside the container.

Insert the glass or metal thermocouple tube into the inch length of 1/8-inch pipe; move this pipe along the glass tube until it is back out of the way. Insert the thermocouple tube into the reducer bushing; locate this tube so that its tip is at the center of the can. Force a single strand of twisted valve stem packing around the glass tube inside of the reducer bushing. Thread the 1-inch length of 1/8-inch pipe into the reducer bushing and draw up tight with a pair of pliers to compress the packing to form a pressure tight seal. This length of pipe serves as a packing gland nut. Place the product to be processed into the can carefully in order to avoid damage to the thermocouple tube, double seam the container, make the necessary electrical connections through a gland in the cover of the retort, and all is in order for the determination of heat penetration data.

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BIGELOW, W. D.; BOHART, G. S.; RICHARDSON, A. C.; and BALL, C. O.

1920. National Canners Association Bulletin 16 L.

AMERICAN CAN COMPANY

1946. Private communication.

REFREEZING PACKAGES DEFROSTED IN TRANSIT

There are occasional instances in which frozen packages of seafoods become partially or totally defrosted during transit or even while in storage. When this has occurred it is necessary to exercise considerable care in the handling, or the loss due to spoilage may be excessive. The first step in making an examination of such a shipment is a careful inspection of each package in each carton. The packages should be separated into two groups, those only partially defrosted and those which are completely defrosted. The first lot, the partially defrosted cartons, can be placed in a quick or sharp freezer and handled in the same manner as that which was used in the original freezing operation. After they are refrozen the individual packages can be repacked in the shipping carton for storage. If attempts are made to refreeze in the original shipping carton it is likely that excessive losses by spoilage will be experienced. This is explained by the fact that the carton is a fair insulator, and, should the packages be placed in it before they are solidly frozen, several days would probably be required for freezing those in the center of it. During this lapse of time, spoilage could occur and then the packages in the center would be unfit for food.

--Fishery Leaflet 214

SOME OBSERVATIONS ON FISH PROCESSING IN NORWAY

By William S. Hamm*

INTRODUCTION

During July and part of August 1946, various fish-processing plants were visited in the area from Stavanger to Trondheim, Norway. The principal purpose of this tour was to learn whether the Norwegian sardine industry was employing methods that might be applied in the United States for the improvement of our domestic sardine pack. Incidental observations on the manufacture of byproducts, the refining of herring oil for use in sardine canning, and the preservation of cod are also reported here.

The Sardine Industry

THE SARDINE FISHERY: Two species of fish are canned as sardines in Norway, the brisling (Clupea sprattus) and the herring (Clupea harengus). The packs prepared from the brisling are generally considered to be of finer quality than those prepared from herring.

The brisling, which are small even when full grown, are canned when mature, and the size varies from 12 to 40 fish to the one-quarter pound sardine can. They are caught in commercial quantities from Oslo on the East coast to Aalesund on the West coast, the season extending from the latter part of June into August. However, the entire year's supply for a particular area may be caught within a period of about 10 days. The brisling are generally caught with purse seines and are held alive in temporary net enclosures or pounds for periods up to a month or longer. Each morning, the day's requirement of fish is dipped out and packed with ice in boxes which hold about 35 to 40 pounds of fish each. Transport boats then carry the boxes to a central wharf, where the fish received from the various pounds are dispatched by trucks or small boats to individual canneries in the area.

The herring grow to a larger size than the brisling and are canned as sardines when immature. Small herring are taken from May to January, and the fishing methods are similar to those used for taking brisling. The geographical range of the herring is more extensive; shipments from some fishing grounds to the canneries being en route as long as 72 hours.

WASHING, BRINING, AND STRINGING: After the fish are received at the cannery, they are either placed in a refrigerated room or are well iced. As fish are needed, they are washed thoroughly in large tubs to remove scales and dirt. Some canners use mechanical rotary washers. The washed fish are then placed in a tub of brine with an excess of fine salt. Each tub holds several hundred pounds of fish; and the fish are left in the brine for 10 to 30 minutes, the length of time depending on the size and fat content of the fish.

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If brisling or small herring are being prepared, they are then taken to work tables for stringing. Each table has a hinged metal attachment connected to it which has rows of parallel grooves cut into its top, and a woman worker places the fish headfirst in the individual grooves. The grooves hold the fish firmly so that the worker can quickly pass a wire through a slot vertical to the grooves thus piercing the heads of all the fish in the grooves. The worker then opens the hinge of the metal attachment and removes the string containing 22 fish and places it in a rack which accommodates 30 wires. The loaded frames are then placed on wheeled racks, about 10 frames to the rack, and wheeled to the smoking and cooking oven.

SMOKING AND COOKING: The smoking is most commonly carried out in a horizontal oven or tunnel about 50 feet long, through which the racks are pulled by a motor-driven chain. Furnaces burning various types of hard wood are connected to the end of the tunnel at which the fish leave. The smoke and hot gases are drawn through the tunnel by a suction fan placed at the end where the fish enter.

A uniform circulation of smoke is obtained, first, by the use of solid metal plates which form the back of each rack and prevent horizontal movement of the smoke and, second, by the installation of smoke channels placed alternately along the top and bottom of the tunnel to direct the smoke up through one rack of fish and down through the next. This arrangement eliminates channeling of the smoke and makes certain that all the fish will be equally cooked and smoked.

At the end of the tunnel where the fish enter and the smoke is discharged, the temperature of the smoke is about 175° F. At the other end, where the fish leave and the smoke enters, the temperature is about 260° F. The temperature is controlled by a system of manually-operated checks and dampers which regulate the entrance of air and the rate of combustion in the furnaces. The smoking and cooking operation requires 30 to 55 minutes depending on the size of the fish.

In some plants the smoking and cooking operation is carried out in a vertical smokehouse. The individual frames are carried, first up and then down, on a continuous conveyor, the length of the complete path being about 50 feet. This type of smoker is fired with hard wood directly underneath the vertical sections of the conveyor.

PACKING AND SEALING: The sardines after coming from the smoke oven and cooling somewhat are beheaded mechanically, one frame at a time. Small pans on a conveyor pass beneath the beheading machine, catch the bodies, and continue on to the packing tables. Here women workers pack the fish in cans to which some of the canning oil has already been added. The packers take great care to fill each can neatly with fish of uniform size. The filled cans are carried on trays to inspectors who carefully examine each can, adding or removing fish as needed and replacing any damaged fish.

The cans then receive additional oil and are carried to the sealing machine. Here one worker places the lids on the cans, and another worker feeds the cans to the machine. The machines in common use are of French make and are capable of sealing about 2,600 cans per hour.

PROCESSING: The sealed cans are placed in small metal wagons which are then run into horizontal retorts where the fish are processed under steam and air pres-

sure. The process technique is practically the same as that used for glass containers which cannot stand an internal pressure in excess of the external pressure, and is necessary for the aluminum cans used in Norway for the sardine pack. The cans are kept submerged under water during the process, and air is pumped into the retort to maintain a partial pressure of about 8 pounds per square inch. The one-quarter cans are cooked for about one hour at 240° F., and are then cooled by the introduction of cold water into the retort. The air pressure is not reduced until the cooling operation is completed.

After being cooled, the cans are cleansed in a washing machine with a detergent solution. Later, they are wrapped in paper, the keys are inserted, and the wrapped cans are labeled and packed 100 to the case.

CANNING OF LARGER HERRING: Those herring that are considered too large for the best grades of sardines are treated somewhat differently from the brisling and smaller herring. The larger herring are first beheaded; and then, after being washed and brined as previously described, they are spread on wooden-framed, wire-bottomed trays, about 20 inches square. The trays are stacked in racks and the fish steamed in metal steam boxes and then dried in a tunnel drier. The subsequent packing, oiling, and processing are the same as for the smoked sardines. The steam-cooked pack is considerably lower priced than the smoked pack.

HERRING OIL FOR CANNING: The refining of herring oil for human consumption has been relatively more common in Norway than in other countries. When sufficient quantities of other oils could not be obtained, the Norwegians began to employ specially refined herring oil in the canning of sardines.

The raw herring oil, which may have an objectionable odor and color, is shipped from the reduction plants to centrally located refineries. At the refinery, the oil is destearinated, treated with alkali, filtered with various filter aids, polymerized, and deodorized by being blown with superheated steam at a low pressure and high temperature.

The refined product is somewhat more viscous than the crude oil and is also clear, light colored, and practically free from taste and odor. It is claimed to be quite satisfactory for use in the canning of sardines, at least to consumers who do not have a definite taste preference for olive oil. Although this specially refined herring oil is stated to be more resistant to the development of rancidity than ordinary refined fish oils, it is less resistant to oxidation than high quality, edible vegetable oils. The cost of the specially refined herring oil was slightly greater than the price of domestic soya oil during the summer of 1946.

The 1946 specifications for polymerized marine animal oils for use in the canning industry for the packing of sardines were reported by Ronold and Taarland in the March 1947 issue of the Norwegian Canners Export Journal as follows:

ORGANOLEPTIC PROPERTIES

1. The oil shall be clear, that is, carefully filtered, free from moisture, slime, and other impurities.

2. The color shall be from pale yellow to golden yellow.

3. The odor and taste shall be clean, good, and tenable.

PHYSICAL PROPERTIES

1. Only insignificant amounts of solid fat shall separate with cooling to 6° C. for three days.

2. The viscosity at 25° C. shall be between 80 and 140 centipoise.

CHEMICAL PROPERTIES

1. The content of free fatty acids (calculated as oleic acid) shall not be over 0.3 grams per 100 grams of oil.

2. The saponification number shall be between 180 and 200.

3. The iodine number (determined by Wijs method) shall be between 95 and 110.

4. The polybromide number shall not be over 2.0 (calculated as grams of polybromides per 100 grams of oil).

5. The content of unsaponifiable matter shall not be over 1.0 gram per 100 grams of oil.

6. The rancidity number shall not be over 2 red Lovibond units by the quantitative Kreiss test.

7. Saponification with n/2 alcoholic KOH shall produce a yellow colored and not a dark brown colored mixture.

8. The ash content shall not be over 30 milligrams per liter of oil.

QUALITY CONTROL: All the canners of fishery products for export belong to cooperative marketing organizations known as "Centrals," there being a Central for each product made in sufficient quantity. The Central functions as a clearing house for the smaller packers, receiving their packs and releasing them to export shippers. The Central hires inspectors to examine the canneries and to sample and grade each lot submitted for export. If the specified standards for packing are not met, the inspectors can close the cannery or down-grade the pack.

In addition, the canners maintain a cooperative laboratory which is partly financed by the government. This laboratory engages in research of value to the canners, sets standards, and serves as referee in any disputes which may arise over decisions of the inspectors employed by the Centrals.

ECONOMIC ASPECTS: The cost of fishing for sardines is in most cases borne by the packers who form fishing associations composed of several packers. They then make agreements with the fishermen and usually provide most of the gear. The fish are apportioned to the various packers in the association on the basis of the financial investment in the association. The packers claimed that the brisling would cost about $3.00 per finished case of 100 cans and that the herring sardines would cost from $1.60 to $2.00 per case for the raw material.

The packers stated that the production of sardine fish was not subsidized by the government. However, a considerable part of the fish production is subsidized by government payments to the fishermen, because it is claimed that the processors cannot meet foreign competition and at the same time pay the fishermen enough to support a reasonable standard of living.

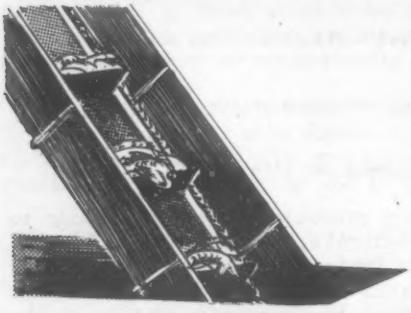
The workers in the canning plants do not appear to earn as much, in terms of dollars, as comparable workers in the United States. The labor cost, in the Nor-

wegian sardine canneries, for stringing and packing the sardines is about $0.40 per case of 100 cans. It was said that women engaged in this work earn about $15 to $18 per week and that men working in the same plants earn about $25 per week.

Most of the canneries fabricate their own cans, but some types of aluminum cans which are difficult to make are manufactured centrally. In many cases, the can-manufacturing machinery was antiquated and required considerable labor for its operation. Depending on the plant efficiency, the cost of fabricating one-quarter sardine cans varied from $18 to $30 per thousand. The canners realize that central can manufacture might be cheaper, but they state that local manufacture is necessary as a means of providing more continuous employment for their workers.

Fish Meal Production

Two fish meal plants were visited. Each has six unloading stations so that several vessels can unload simultaneously. At each station bucket conveyors carry the fish to measuring boxes. A chain-and-drag conveyor transfers the fish from the measuring boxes to large, outdoor, concrete, storage bins. Since the greater part of the catch is taken in winter, several days' requirement of fish can be held without serious effect on the quality of the meal.



FISH CONVEYOR BELT

The first plant visited was in the Bergen area. It operates somewhat similarly to California pilchard plants. The fish are first cooked and pressed. The press liquor is centrifuged to separate the oil from the stickwater, and the solids are dried in direct-fired rotary driers.

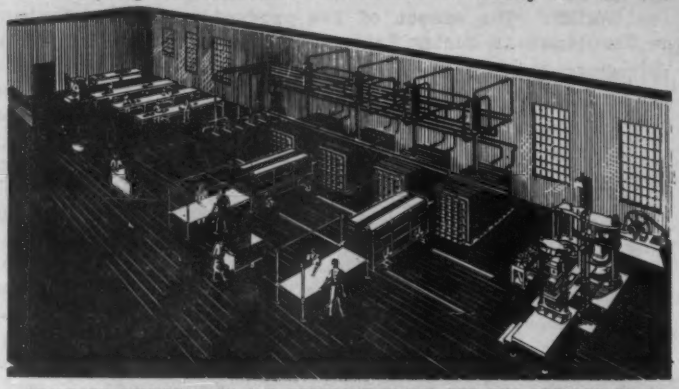
The second plant was at Stord. It is newly designed to save the soluble materials usually lost in the stickwater. When lean fish are being reduced, they are first disintegrated and then mixed with enough dried, or partially dried, fish meal to change the character of the wet raw material sufficiently so that it does not stick to the surface of the first rotary drier. This drier is an oil-fired, rotary type and is operated at a very high temperature. The material leaving this drier contains about 35 percent moisture; and about half of it is then mixed with new raw material, the proportions depending on the material being handled; and the mixture is fed back to the same drier. The other half of the discharge is fed to a second oil-fired, rotary, flame drier in which the drying is completed.

When fatty fish are being reduced, the discharge from the first drier is heated indirectly to about 200° F. and pressed. The oil is separated from the stickwater with centrifuges, and about half the stickwater and half the presscake is returned to be mixed with the incoming raw material. The remainder of the stickwater and presscake is dried in the second rotary drier.

This process, although it has the advantage of making possible the recovery of solids normally lost in the stickwater, has the disadvantage of reducing the plant capacity by about two-thirds.

Dehydration of Cod

A large part of the cod caught in Norway have in the past been dried either with or without salting. The drying is somewhat difficult to carry out in the weather prevalent on the Norwegian coast; and, although considerable labor is required, these products do not bring high prices. In an attempt to overcome some of these difficulties, one company in Aalesund had developed a dehydrated product called "pressfisk" which is now almost ready for commercial production. Similar products will also be prepared by the same method from pollock and other fish.



STANDARD DEHYDRATION AND PRESSING PLANT FOR THE PRODUCTION OF PRESSFISH FROM COD, SAITHE, HADDOCK, ETC. (NORWEGIAN COAST)

The fish are first cleaned and split, the bones and skin are removed, and the flesh is laid flat on an aluminum sheet about 8 feet long by 4 feet wide. A second aluminum sheet is placed over the fish on the first sheet. Several of the "sandwiches" so obtained are placed in the vacuum dehydrator. The dehydrator has a series of hollow plates, similar to a "Birdseye" freezer and one "sandwich" is placed between each pair of opposing surfaces of the hollow plates. The plates are then pressed together by a hydraulic jack, the dehydrator is shut and evacuated to an internal pressure of about 25 millimeters of mercury, and hot water at 194° F. is circulated through the hollow plates. The heat passes readily from the hollow plates through the aluminum sheets to the fish.

After about 6 hours, the flattened fillets are sufficiently dehydrated. They are then removed from the aluminum sheets and stacked in a dry room for a few days to allow equalization of the moisture content. Then 15-inch squares are cut from the fillets and fitted in layers into a deep, closely fitting receptacle of a hydraulic press. The fish are pressed twice: first rapidly at a pressure of about 5,000 pounds per square inch, next in a second press for about one-half hour at a somewhat higher pressure. The final block produced is approximately 15 inches square by 10 inches high. This is cut by a band saw into package-sized pieces approximately 5 x 2½ x 1 inches. The final product contains about 10 percent moisture and is said to absorb about one and one-half times its weight of water on being soaked several hours.

SECTIONAL REVIEWS

South Atlantic

SHRIMP: The season of low production in the shrimp industry of Georgia and the Carolinas is during February and March. Most of the dealers take advantage of this slack season to make necessary repairs to shore establishments, boats, nets, and equipment, because even though higher prices prevail at this season, they do not find it profitable to operate the large trawlers. Dealers who traditionally operate from Charleston, S. C., to St. Augustine, Fla., following the shrimp run have moved back to headquarters and are getting ready for another season. Many large, new shrimp trawlers will be ready for the coming season.

LARGE SHRIMP TRAWLER AND GEAR ARRANGED FOR SETTING

Dealers returning from Florida report that the winter season there was below normal. Georgia and South Carolina dealers have made the statement that the 1946 season was less profitable than that of 1945.

Among the trade, there appears to be many reasons for this apparent decline in shrimp production. The opinion most prevalent is that there is too great a concentration of the large modern trawlers, with their large nets, trawling the comparatively restricted shrimping grounds of the South Atlantic. Total catch for 1945 in Georgia and South Carolina shows an increase over the figures taken in the last previous survey made in 1940 but catch per vessel shows a decrease. Catch figures for 1946 are not available as yet, but indications are that both total catch and catch per vessel, will show a decline.

SHAD: The 1947 shad season which opened January 1 in Georgia closed on March 31. The usual efforts to extend the season several weeks were made, but were unsuccessful. The catch was larger than that of the 1946 season but was still below the average for the past five or six years. Prices were reported good for the season as a whole, but toward the end of the season several dealers had losses on the last few shipments.

TECHNOLOGICAL RESEARCH IN SERVICE LABORATORIES

MARCH 1947

College Park, Md.

Two air shipments of crab meat and Pacific oysters with corresponding shipments by railway express were made from the Seattle Laboratory to the College Park Laboratory in connection with the air-borne fresh fish project. Shipments of air-borne fresh fish between Florida and the College Park Laboratory were increased over those of the previous month.

* * *

The regular monthly examination of frozen Spanish mackerel and sea trout fillets wrapped in various types of moisture-vapor-proof films has shown no definite trend in flavor changes of the fillets. The frozen oysters in different types of packages have shown very little change in pH values and their flavor is remaining satisfactory.

COUNTING BACTERIA COLONIES

* * *

Several laboratory tests were made with insulated shipping containers for possible use in shipping frozen fish. The results were quite variable between the different types of containers and it appears that dry ice will be required inside the packages if a shipping period of more than two days is necessary.

* * *

An A.O.A.C. assay to determine the vitamin D content of two seal oil samples indicated that the blubber oil and carcass oil in each contained about 25 International Units of vitamin D per gram.

* * *

Home economists gave four fish cookery demonstrations in Milwaukee, and spent three days in Minneapolis in a "workshop" discussion period and fish cookery demonstrations with extension specialists at the University of Minnesota. Ten demonstrations were given to a total of 643 persons in North Carolina.

* * *

Palatability tests were conducted on 20 samples of frozen mackerel fillets, 18 samples of frozen oysters, 14 samples of frozen sea trout, and 22 samples of fresh fish in the Florida air shipment tests.

* * *

Eight recipes were tested to determine the palatability of canned silver hake.

* * *

The survey of the antibacterial spectrum of the organism under study was continued using various agar media. Results obtained so far indicate that the inhibitory substance tends to be more active against molds than against bacteria.

* * *

The confirmatory tests on the enterococci cultures isolated during the Parker River Refuge project were completed and the results tabulated.

Boston, Mass.

A study is being made of herring infected with fungus Ichthyosporidium hoferi. Efforts to develop methods of culling the herring at some point in sardine canning operations have not yet been successful.

* * *

Assistance in determining the most suitable types of fishing gear for two exploratory fishing vessels being made ready for operations in the Gulf of Mexico was provided during a field trip to Pensacola, Florida. Several new fishing areas have been located at depths (80 to 100 fathoms) greater than those usually fished. The hand line now in use is difficult and cumbersome to operate at these depths. Power gurdies to pull in hand lines have been tried but have not proven entirely satisfactory. A mechanical reel using a fluid drive motor as a power source was suggested as an improvement for hauling in hand lines. A collapsible fish pot of the design used in the West Indies was suggested as a secondary gear.

* * *

At the request of an air lines company, a lobster shipping box was given a 24-hour holding test at 90° F. Twelve lobsters and a recording thermometer were packed in the box in eelgrass with 10 pounds of ice in a special tray at the top. After 24 hours, nine lobsters were alive and there were two pounds of unmelted ice. The inside temperature of the box did not go above 50° F. The three dead lobsters were on the bottom of the box in water from the melted ice. The box is being redesigned so that none of the lobsters will be in water.

* * *

New lots of smoked pollock fillets were prepared using frozen fish. Some fillets were hot smoked. These fish are being submitted to interested parties for criticism.

Ketchikan, Alaska

A thorough survey of the Alaska beaches to determine the extent of mytilotoxine in the butter clams cannot be made due to lack of funds, so it is planned to collect samples by whatever means possible. Efforts are being made to devise processing methods which will destroy any material that is toxic.

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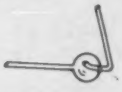
Tests on the canning and freezing characteristics of sea cucumbers were made using specimens provided by a local diver. One minced lot was canned.



Mayaguez, P. R.

Scheduled educational field trips were made to production centers and to wholesale and retail establishments.

* * *

Fish poisoning work was resumed on a shipment of fish from the Virgin Islands. Feeding tests were conducted but no positive results were recorded.

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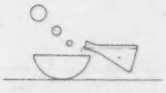
A cooperative project on oysters is being conducted with the University of Puerto Rico.



Seattle, Wash.

Storage tests on frozen king crab are beginning to indicate that this species may have better frozen storage properties than Dungeness crab.

* * *

Use of NDGA as an antioxidant for frozen pink salmon and steelhead, either alone or with carrying agents, does not appear promising, at least using aqueous or oil dips of the antioxidant for the fish fillets. No improvement in storage life of the fish was indicated when the antioxidant was applied in these ways.

* * *

Two members of the Seattle staff attended the Frozen Foods Exposition in San Francisco and helped with the Fish and Wildlife Service booth.

* * *

A fishery display was set up at the Washington State Home Economics Association Conference at Ellensburg, Wash.

* * *

A fish cookery demonstration was given at the University of Washington to 50 home economics students.

* * *

The large mobile trailer laboratory was in use at South Bend, Wash., during the month. A preliminary study of correlation of pH of Pacific oysters to spoilage did not give any indication that pH of oysters taken in this area was generally lower than that of Eastern oysters at the same stage of freshness. Some bacteriological tests of crab meat were also conducted.

* * *

Chemists of a cooperative were assisted in the dehydration of ling liver stickwater waste for the recovery of a quite large quantity of vitamin A contained therein.

* * *

Vitamin assays were carried out on oils prepared from salmon viscera, total salmon waste, and salmon tail sections.

* * *

Recipes using frozen smelt and canned minced razor clams were tested.

FISH REDUCTION PROCESSES

Reduction of fish and fish waste to fish meal and fish oil has been the basis for commercial operations along our seacoasts for many years. Methods employed have changed with the gradual improvements in equipment available for adaptation to the peculiar needs of the operators and with the background of practical experience that only actual plant operation can develop. The fish processors' control over raw materials harvested from the sea is very limited even as to quantity and quality. Localized adaptations of plant equipment and day to day changes in technique of operations by plant crews have been as important as have been the original designs of factory installations.

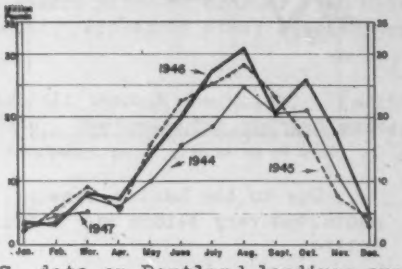
--Fishery Leaflet 126

FRESH AND FROZEN FISH

New England

MAINE LANDINGS: Maine fishermen landed 5,915,000 pounds of fishery products, valued at $532,743, during March bringing the total for the first three months of the year to 13,659,000 pounds, valued at $1,542,912, according to Current Fishery Statistics No. 345. Four items--rosefish, herring, soft clams, and lobsters--accounted for 78 percent of the volume and 79 percent of the value of the landings during the first three months of the year.

LANDINGS AT MAINE PORTS, 1944-47



During the period from July to December 1946, data on landings at Portland, Maine, were included in the monthly New England bulletins entitled "New England Landings" and "Maine Landings." Beginning with January 1947, data on Portland landings are included only in the Maine bulletin.

During March, landings at Portland amounted to 1,481,000 pounds, valued at $63,694. This was a decrease of 43 percent in the volume and 52 percent in the value of the landings at Portland compared with March 1946.

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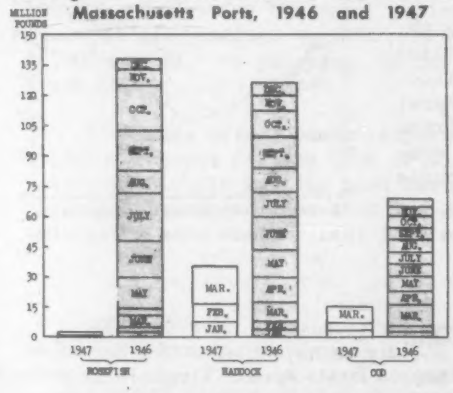
Landings of Rosefish, Haddock, and Cod at Massachusetts Ports, 1946 and 1947



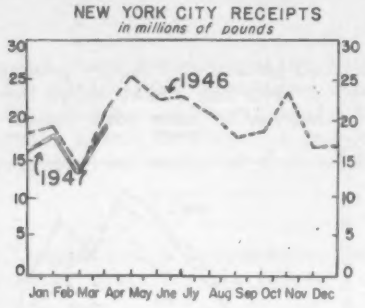
MASSACHUSETTS LANDINGS: Landings of fish and shellfish at the ports of Boston, Gloucester, New Bedford, Provincetown and other Cape Cod ports during March amounted to 31,909,000 pounds, valued at $2,719,337 to the fishermen, according to Current Fishery Statistics No. 346. This was an increase of 1 percent in volume and 12 percent in value compared with the same month in 1946. Landings at Boston during the first three months of 1947 were 248 percent greater than in the same period the previous year, while those at Gloucester and New Bedford showed declines of 60 percent and 55 percent, respectively.

Middle Atlantic

NEW YORK CITY ARRIVALS: Landings and receipts at New York's Fulton Market during March totaled 17,862,000 pounds, or 3,997,000 pounds more than the arrivals during February, but 2,138,000 pounds less than the total for March 1946, according to the Service's Market News Office in that city.

Abundant important species were: cod, yellowtails, haddock, flounders, fluke, and scup. Shad appeared in greater amounts during the latter part of March. Moderate amounts of croakers from the Chesapeake area were available.

The purse seine fishery for Boston mackerel was off to an early start with the arrival of three boats at Norfolk, Va., on March 19 with over 125,000 pounds. Following this early beginning by the seiners, the winter trawl fleet of draggers fishing out of Virginia ports caught unusually large quantities of this species. A liberal share of these early mackerel catches was shipped to the New York market.



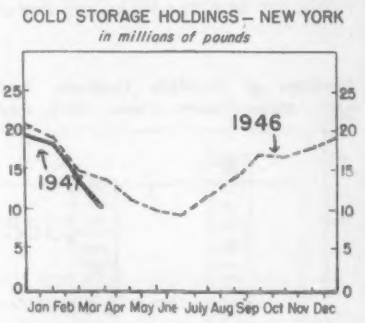
Forty-four trips of fish landed at New York during March, totaling 1,828,000 pounds. This total is over a half million pounds less than the amount landed during the same month last year, although the number of trips was eight less this year.

Due to the Lenten season, there was a moderate demand for fish during the month, but very seldom was it brisk. The market throughout the month was moderately active.

* * * * *

NEW YORK CITY COLD-STORAGE HOLDINGS: Holdings of frozen fish and shellfish in the New York City metropolitan area, on April 1, 1947, totaled 10,294,000 pounds, a decrease of 26 percent compared with the previous month, and a decrease of 27 percent compared with the same period of last year, according to the Fishery Market News Office in that city.

Cod fillets, sablefish, and salmon were the only species with holdings of over one million pounds. Other leading items were halibut, cisco, whitefish, lobster tails, and shrimp. Mackerel holdings were down to 16,000 pounds. Shrimp holdings declined close to 400,000 pounds, compared with last month, and about 800,000 pounds compared with the same month last year.



Chesapeake

PRODUCTION: Production of fish in the Hampton Roads area of Virginia increased from 3,117,000 pounds in February to 5,185,000 pounds in March, or 66 percent, according to the local Fishery Market News Service Office. This represents an increase of 509,000 pounds, or 11 percent over the production for February 1946. Of the total production, 2,171,000 pounds, or 42 percent, were croaker. The next three species were gray trout, scup, and sea bass. Practically all of the catch was made by otter trawlers working offshore. Landings of fish in the other areas of Virginia, Maryland, and North Carolina covered by the Hampton Market News Report were small during March, but are expected to be much larger in April.

Production of fresh picked crab meat in the Virginia-Maryland areas included in the report amounted to 99,000 pounds, an increase of 22,000 pounds, or 29 per-

cent, over February. For March 1946, the production in the same areas was 136,000 pounds, or 38 percent, over that for the same month in 1947.

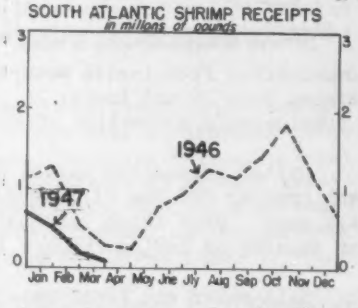
Production of shucked oysters increased from 221,000 gallons in February to 247,000 gallons in March. The 1946 production during the same period was 176,000 gallons.

The demand for fish during the month was good and the prices were satisfactory to both the fishermen and the dealers. The ex-vessel price of croaker, the chief species produced, was from 6 to 10 cents per pound. Prices of other species were comparable to those of croaker.

The scarcity of crab meat kept the price high all through the month. Dredging for crabs was extremely poor all through the winter. The demand for shucked oysters was only fair with prices reflecting the poor demand.

South Atlantic

SHRIMP PRODUCTION: Shrimp production for Florida and the South Atlantic States during March amounted to 113,000 pounds (heads off), 54 percent less than last month, and 59 percent less than landings in March 1946, according to the Jacksonville Fishery Market News Office.



Florida landings were 11,000 pounds against 199,000 pounds for the same period last year, while Georgia landings were 102,000 pounds against 80,000 pounds, an increase of 28 percent over March 1946.

Fishermen of many years' experience were at a loss to account for the lack of shrimp on both coasts of Florida for the past few months, some offering the explanation that the shrimp went elsewhere to spawn, due to the unseasonably warm weather last fall and winter.

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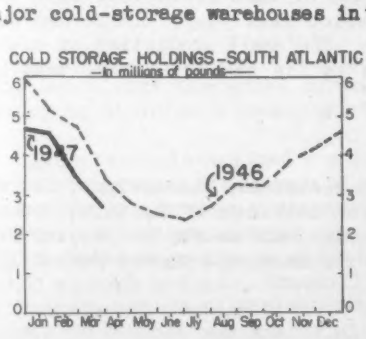
COLD STORAGE: Frozen fish and shellfish holdings on April 1 for the five major cold-storage warehouses in the South Atlantic States totaled 2,706,000 pounds, according to the Service's Market News Office in Jacksonville, Fla. Compared with holdings on March 1 of 3,458,000 pounds, this month showed a decrease of 752,000 pounds, or 22 percent. Total withdrawals exceeded total receipts by 752,000 pounds. April 1 holdings this year were 823,000 pounds less than on April 1, 1946.

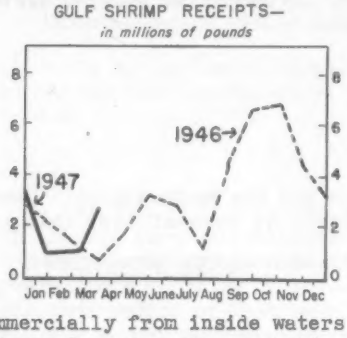


The leading items with stocks of over 100,000 pounds are, in order of quantity, as follows: mullet, fillets (cod, haddock, pollock, and rosefish), shrimp, whiting and king whiting, Spanish mackerel, and scup.

Holdings of fish decreased 683,000 pounds and holdings of shellfish decreased 68,000 pounds during March. Large withdrawals of mullet, scup, Spanish mackerel, red snapper, catfish, fillets (except pollock), and shrimp during the Lenten period accounted for the major reduction. There were some gains in the holdings of croaker, pollock fillets, sea herring, crabs and crab meat, and spiny lobster.

Gulf

PRODUCTION: Shrimp landings for Alabama, Mississippi, Louisiana, and Texas, as reported to the Fishery Market News Office in New Orleans, although still not heavy, were 42 percent greater than February landings and nearly twice as great as the amount produced in March 1946. In spite of this, landings from January through March 1947 were approximately 30 percent less than during the same period last year.



The season for catching shrimp in inside waters of Louisiana opened March 15 after being closed since December 16. This accounted for the increased production this month. Most of the shrimp were small to medium in size. In previous years, the closed seasons for taking shrimp commercially from inside waters of Louisiana were between March 15 and May 16 and between June 25 and August 16. Since the opening of the closed season this year, a considerable proportion of the small shrimp was reported to be used for canning.

Oyster production during March was over twice that of February, and 59 percent greater for the first quarter of 1947 than during the corresponding period last year. Over twice the quantity of oysters have been reported as being used for canning as during January through March of 1946.

Salt-water and fresh-water fish production in March compares favorably with the quantity landed in February. The use of nets for catching fish in the inside coastal waters of Louisiana is prohibited for the first time, beginning April 1 and ending May 31, according to an Executive Order issued by the Commissioner of Louisiana Department of Wildlife and Fisheries.

From January through March this year, landings of hard crabs were less than one-third the quantity landed during the same period last year. There has been no appreciable production of soft crabs this year. The small production of crabs, for the most part, is reported to have been due to the cooler weather that has prevailed during the first three months of 1947.

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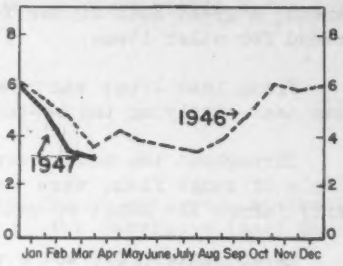
COLD STORAGE: Eleven cold-storage warehouses in Alabama, Mississippi, Louisiana, and Texas reported frozen fish and shellfish holdings of 2,656,000 pounds on April 3, 1947, 13 percent less than four weeks ago, and nearly 30 percent less than total holdings on April 4, 1946, according to the Service's Market News Office at New Orleans.

Compared with holdings of one year ago, nearly all seafoods show a decline, except rosefish fillets, which were 67,000 pounds greater, and cooked and peeled shrimp, which were 77,000 pounds greater than last year.

GULF COLD STORAGE HOLDINGS
in millions of pounds



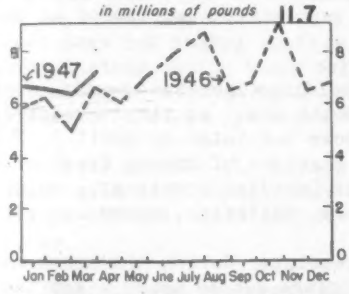
Frozen shrimp holdings on April 3 amounted to 1,118,000 pounds, 125,000 pounds less than four weeks ago and 400,000 pounds less than last year.

Salt-water fish holdings amounted to 1,270,000 pounds, 316,000 pounds less than four weeks ago and 875,000 pounds less than last year. Five items--mullet, rosefish fillets, cod fillets, Spanish mackerel, and whiting and king whiting--made up over one-third of the volume.

Great Lakes

RECEIPTS: Receipts of fresh and frozen fishery products in the Chicago wholesale market during March totaled 7,249,000 pounds. This was an increase of 14 percent compared with February and was 15 percent above March 1946, according to the Chicago Fishery Market News Office.

CHICAGO RECEIPTS
in millions of pounds



Compared with February, fresh-water receipts advanced 41 percent but were 12 percent below March 1946. Salt-water receipts fell 12 percent below those of February but were 53 percent greater than those of March 1946. Shellfish arrivals were 6 percent above those during February and 94 percent higher than for March 1946.

Chief reasons for the gain in fresh-water species were larger receipts of frozen lake trout, saugers, whitefish, and yellow pike from Canadian provinces. A 100 percent increase in arrivals of lake herring from Michigan, Minnesota, and Wisconsin added greatly to fresh fish arrivals as did important receipts of smelt from the evidently rejuvenated waters of Michigan and Wisconsin. Arrivals of smelt during March exceeded those of March 1946 by 275 percent.

Arrivals of haddock, and haddock and rosefish fillets showed important gains during March, but the total of salt-water fish receipts was kept comparable to February by diminished receipts of halibut, cod fillets, and salmon.

Shrimp receipts declined 8 percent during March. This was, however, an expected seasonal occurrence. Mexican frozen shrimp again, as during the past few months, formed a very important part of all shrimp arrivals, representing 36 percent of the total. Fresh shrimp were nearly non-existent during March, shipments arriving being confined to a few barrels at a time which were sold out immediately upon arrival at high prices. Unusually large receipts of frozen spiny lobster tails from Florida and South Africa more than offset the decline in shrimp, but oysters declined 35 percent and nearly all other shellfish items showed decreases.

After playing a very minor part in the fishery products picture during most of the winter months, halibut regained its normal important position during the Lenten season. Most arrivals were sold directly to the consignee's customers without reaching cold-storage warehouses. Salmon, chiefly chum salmon, was in very little demand, a great deal of the fish arriving being re-consigned to other cities or traded for other items.

Fresh lake trout and fresh whitefish, except for one brief period, never came near supplying the Lenten demand for these varieties.

Throughout the month nearly all daily receipts, except occasional heavy arrivals of rough fish, were sold out long before the market closed. Customers early formed the habit of collecting their daily purchases in their own trucks.

March, generally, was a very good month for the Chicago dealers, the supply being just about sufficient for the demand, except for lake trout and whitefish. The lack of these latter items helped deplete cold-storage holdings. Prices were good, too, with little fluctuation.

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COLD STORAGE: Holdings of fishery products in Chicago cold-storage warehouses on April 3 amounted to 5,045,000 pounds, a decline of 16 percent from holdings on February 27, according to the Service's Market News Office. Compared with holdings on April 4, 1946, this total represents a decline of 24 percent.

Fresh-water holdings increased nearly 1 percent during the month and, at times, reached a point 6 percent above the total on April 3. This was due to large receipts of frozen fresh-water varieties from the Canadian provinces, chiefly lake trout, saugers, whitefish, and yellow pike.

Salt-water receipts during the month were light and resulted in a decline of 20 percent in holdings due to heavy withdrawals during the Lenten season. However, the decline would have been greater had not important receipts of fillets from the eastern area arrived during the month. These arrivals were usually sold direct from the dealers' floors and were not placed in cold-storage warehouses at any time.

Shellfish holdings declined 27 percent. As usual, the chief item of withdrawal was shrimp, holdings declining 34 percent.

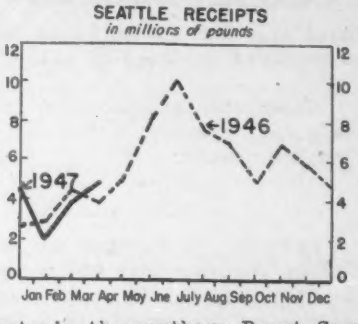
In the fresh-water section, gains were shown by lake herring, 102 percent; chubs, 21 percent; lake trout, 100 percent; and whitefish, 5 percent. General small declines in nearly all other varieties kept the fresh-water total comparable with a month earlier.

Of the salt-water items, salmon increased 35 percent over February, but the total for this variety was comparatively small. Fillets declined 31 percent during March with cod fillets declining 45 percent and rosefish fillets, 29 percent. Halibut declined 10 percent from a relatively small amount.

Shrimp holdings on April 3 were 517,000 pounds. Local dealers complained of their inability to procure enough shrimp for their barest needs even with half a million pounds in Chicago. Most of the shrimp placed in cold storage during the month was put there by dealers not ordinarily considered as fishery firms, such as chain stores. Dealers receiving shrimp during March sold out within a few days, from their own floors.

Pacific

ARRIVALS: Receipts of fresh and frozen fish, shellfish, and livers at Seattle during March totaled 4,313,000 pounds, according to the Service's local Market News Office. This was a decline of 485,000 pounds from the February total of 4,798,000 pounds, but nearly 10 percent more than was received during March 1946. Fairly good fishing weather prevailed in the Straits and offshore waters and otter trawl deliveries of bottomfish slightly exceeded those for the previous month with a total of 726,000 pounds arriving from 42 trips. During the same period last year, 105 trips produced almost a million and a half pounds which were delivered to Seattle. During the past several months, many vessels of the Washington trawl fleet have not landed their catches at the local port, instead making their deliveries at various ports in the northern Puget Sound region where, it was reported, inducements in icing privileges and less strict grading of certain species were being offered trawlers.



Although only 11 vessels landed during the month, receipts of fresh troll-caught salmon, all kings, were almost three times the February quantity and totaled 110,000 pounds. The bulk of this amount was received from coastal points via trucks.

The largest decrease was shown in shipments from Alaska, via coastwise vessels. These receipts dropped nearly three-quarters of a million pounds to a total of 2,645,000 pounds. There was a small increase, amounting to 37,000 pounds, in receipts from British Columbia which raised the March import total to 140,000 pounds, mostly frozen sole fillets and other frozen fillets.

Six species accounted for 75 percent of all receipts and were: Salmon, all species, 1,136,000 pounds, of which 1,026,000 pounds were frozen; frozen halibut, 1,011,000 pounds; frozen sablefish, 515,000 pounds; rockfishes, 320,000 pounds; lingcod, 165,000 pounds; and true cod, 104,000 pounds.

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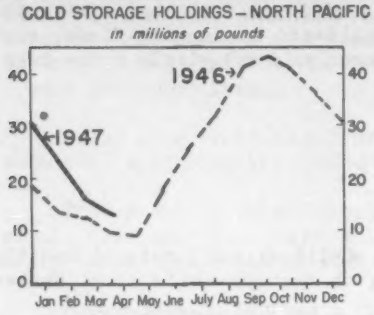
NORTHWEST COLD STORAGE: On April 1, holdings of frozen fish and shellfish in 31 cold-storage warehouses of the Northwest region, including Alaska, amounted to 12,248,000 pounds, according to the Service's Seattle Market News Office.

This was a decline of about 29 percent from the March 1 figure of 17¼ million pounds, but nearly 3 million pounds, or 31 percent, heavier than the holdings on April 1, 1946.

During March, freezings of fish and shellfish throughout the region totaled 2,033,000 pounds, an increase of 414 percent over February, but 21 percent under the March 1946 freezings of 2,500,000 pounds. Bait and animal food, frozen largely in Washington and Alaska cold-storage warehouses, accounted for 87 percent of the area's total freezings. The balance of items placed in cold storage were generally limited quantities of bottomfish, fillets, clams, and crabs.



The consumer demand in many markets during March continued to absorb the major production of fresh fishery products. While holdings of fillets and other varieties showed substantial declines, the withdrawals of chum salmon continued slow and the holdings, which amounted to 2,169,000 pounds, almost equaled the combined holdings of all of the other species of salmon.

Three species accounted for nearly three-quarters of all holdings and were: salmon, all species, 4,589,000 pounds; sablefish, 2,541,000 pounds; and halibut, 1,348,000 pounds.

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LANDINGS IN SOUTHERN CALIFORNIA: San Pedro landings totaled 701,000 pounds in March compared with 803,000 pounds in February, according to the Fishery Market News Office in San Pedro. Mackerel led all other species in this decline by falling from 267,000 pounds in February to 97,000 pounds in March.

San Diego landings dropped from 196,000 pounds in February to 162,000 pounds in March, with California halibut and bonito showing the greatest loss. California halibut landings in February were 59,000 pounds but only 38,000 pounds in March, while the bonito landings totaled 43,000 pounds in February compared with 20,000 pounds in March.

Newport Beach landings dropped over 50 percent when only 111,000 pounds were landed in March compared with 278,000 pounds in February. The decrease was general and included nearly every species of fish normally landed there at this time of the year.

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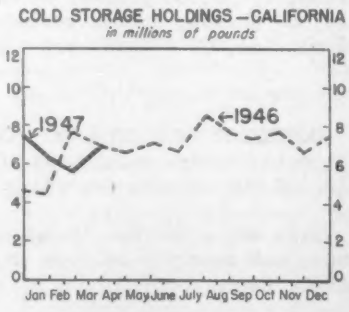
COLD STORAGE: The holdings of fishery products in cold storage in California as of April 1, 1947, compared quite favorably with those of March 1, 1947, and with April 1, 1946, 5,706,000 pounds being held on April 1, 1947; 5,754,000 pounds on March 1, 1947; and 6,982,000 pounds on April 1, 1946, according to the Service's Market News Office at San Pedro.



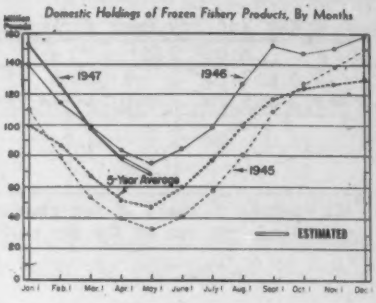
Freezings fell off during March when 301,000 pounds of fish were frozen as compared to 616,000 pounds frozen in February.

Most notable decreases during March were in the freezing of unclassified fish, shrimp, and lobster tails when 66,000 pounds, 171,000 pounds,

and 40,000 pounds were frozen, respectively. During February, 262,000 pounds of unclassified fish, 192,000 pounds of shrimp, and 89,000 pounds of lobster tails were frozen.

United States

COLD-STORAGE FREEZINGS AND HOLDINGS: Stocks of frozen fish and shellfish, held on April 1 by cold-storage operators reporting their activities to the Fish and Wildlife Service, amounted to 78,242,000 pounds, a decline of 20 percent (19,698,000 pounds) below the holdings on the first of the previous month, according to information contained in Current Fishery Statistics No. 335. Stocks of frozen fishery products declined 74,561,000 pounds during the first three months of 1947, compared with a decline of 55,943,000 pounds in the same period in 1946. It is estimated that May 1 holdings will be below 70 million pounds.



Data on the domestic freezings and holdings of fishery products in this bulletin are based on reports for 213 freezers. These are principally public cold-storage plants.

PER CAPITA CONSUMPTION

Per capita consumption of fish has fallen to a level below that of the prewar years, due to a lowered catch and the diversion of canned products to foreign needs. Competition for domestic fishery markets is now coming from distant sources. No longer can the fisheries look upon their domestic prewar or war markets as exclusive property. Improvements in methods of packaging and transporting fishery products are opening up distant markets to remote fisheries. New England and Pacific Coast products are meeting in midwestern markets. Foreign competition is increasing. Imports of frozen groundfish and rosefish fillets in 1946 were five times larger than in 1940. Other protein foods too, such as meat, cheese, poultry, and eggs are seeking their places in the markets, and must be considered important contenders.

--Fishery Leaflet 215

CANNED AND CURED FISH

Shrimp

SHRIMP PACK: The March pack of canned shrimp amounted to 8,439 standard cases, according to reports from canning plants operating under the Seafood Inspection Service of the Food and Drug Administration. This was an increase of almost 900 percent in the pack of the previous month. The pack for the season July 1, 1946 to March 29, 1947 totaled 243,921 cases, almost double last season's pack.

Wet and Dry Pack Shrimp in all Sizes in Tin and Glass--Standard Cases*

MONTH		SEASON		
1947 Mar.2-Mar.29	1946 Feb.25-Mar.16	1946-47 July 1-Mar.29	1945-46 July 1-Mar.16	3-yr.average July 1-Mar.29
8,439	30	243,921	126,465	259,981

*All figures on basis of new standard case--48 No. 1 cans with 7 oz. per can in the wet pack and 6½ oz. per can in the dry pack

Tuna and Mackerel

TUNA AND MACKEREL PACK: The production of canned tuna by California packers during March totaled 292,530 standard cases, according to the California Division of Fish and Game. This was 47 percent more than the February pack and 77 percent above production in March 1946. The total pack during the first 3 months of 1947 amounted to 630,281 standard cases, 28 percent above production for the corresponding period in 1946. The pack of all species of tuna, except yellowtail and albacore, was greater than that in March 1946. The pack of tuna flakes was also higher, and the first production this year of tonno style occurred during the month.

California Pack of Tuna and Mackerel--Standard Cases*

Item	March 1947	February 1947	March 1946	Three mos. ending with March-- 1947	1946
	Cases	Cases	Cases	Cases	Cases
Tuna:					
Albacore	-	-	25	2	25
Bonito	1,170	4,350	852	11,717	3,853
Bluefin	18,960	14,389	8,356	33,349	35,707
Striped	46,550	30,521	8,274	88,603	28,475
Yellowfin	168,671	114,031	121,342	383,206	335,885
Yellowtail	1,423	2,746	2,960	6,017	19,274
Flakes	49,253	32,624	23,169	100,884	68,521
Tonno style	6,503	-	-	6,503	-
Total	292,530	198,661	164,978	630,281	491,740
Mackerel	19,309	114,116	2,555	211,051	50,830

*Standard cases of tuna represent cases of 48 7-ounce cans, while those of mackerel represent cases of 48 1-pound cans.

The pack of mackerel during March--19,309 standard cases--was 83 percent below February. Only 2,555 cases were canned in March 1946. The 3-month pack of 211,051 standard cases was more than four times the pack for the corresponding months in 1946.

FISHERY BYPRODUCTS

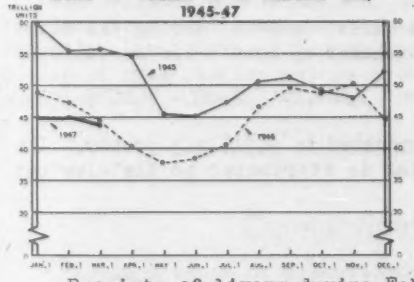
Oil and Meal

PRODUCTION: March is normally the low month in the year for the yield of oil and meal, the production in this month usually amounting to less than 2 percent of the year's total. During March of the current year, 2,299 tons of meal were produced by firms reporting their operations to the Fish and Wildlife Service, and the total production of fish oil amounted to 40,525 gallons, according to Current Fishery Statistics No. 343. This represented a slight decline in the production of meal but an increase in the yield of oil, compared with March 1946.

During the first three months of the year, the production of fish meal and scrap amounted to 8,844 tons, and the yield of oil amounted to 281,071 gallons. This was a decline of 24 percent in the production of meal and 49 percent in the yield of oil, compared with the same period in 1946.

Vitamin A

STOCKS AND PRODUCTION: Stocks of vitamin A in fish-liver oil on March 1 were reported at 43.6 trillion units, a decrease of 3 percent below stocks held on the first of the previous month and 1 percent under those of March 1, 1946, according to Current Fishery Statistics No. 340.



Production of vitamin A during February totaled 3.9 trillion units compared with 2.9 trillion units produced during the same month of 1946. Total production during the first two months of the year amounted to 8.1 trillion units compared with 7.7 trillion units produced during the similar period of 1946.

Receipts of livers during February totaled 817,000 pounds, containing about 4.3 trillion units of vitamin A. During the same month of 1946, 589,000 pounds of livers, having a vitamin A content of 2.5 trillion units, were received. Grayfish livers accounted for 19 percent of the total receipts; their value was 11 percent of the total cost of all livers received; and their vitamin A content was 11 percent of that total.

OTHER FISHERY NOTES

Additions to the Fleet of U.S. Fishing Vessels

A total of 87 vessels received their first documents as fishing craft during March 1947, compared with 61 in the same month in 1946, according to information released by the Bureau of Customs. The South Atlantic and Gulf States lead with 29 vessels documented during the month, followed by the Pacific Coast States with 27 vessels. During the first three months of 1947, 222 vessels received their first documents as fishing craft compared with 146 vessels during the same period in 1946.

Vessels Obtaining Their First Documents as Fishing Craft

Section	March		Three mos. ending with March		Twelve Months
	1947	1946	1947	1946	1946
	Number	Number	Number	Number	Number
New England	8	4	16	13	86
Middle Atlantic	9	8	18	15	74
Chesapeake Bay	8	6	18	10	71
South Atlantic and Gulf	29	18	82	48	351
Pacific Coast	27	17	61	40	375
Great Lakes	4	7	17	15	76
Alaska	1	1	3	2	19
Hawaii	1	-	5	-	17
Unknown	-	-	2	3	16
Total	87	61	222	146	1,085

Note: Vessels documented by the Bureau of the Customs are craft of 5 net tons and over.

Army Fish Purchases

Purchases of fish, by the Army Quartermaster Market Centers, during the first third of the year, amounted to 4,944,626 pounds. Purchases by months are as follows:

January - 1,127,192 February - 1,046,459 March - 1,802,210 April - 968,765

During the same period in 1946, purchases amounted to 9,343,943 pounds. The reason for the sharp decline in purchases of fish is attributed to the slow but steady demobilization of the Army.

Evaluation of Fisheries in Determining Benefits and Losses From Engineering Projects

The national benefits from the commercial fisheries consist of:

1. Earnings of the fisheries (before income taxes).
2. Taxes paid to State, county, and local communities.
3. Earnings by other industries from goods or services furnished to the fisheries.

These three classes of benefits must be computed for each level of the industry; i.e., producer, processor and/or wholesaler, and retailer.

The national benefits from sport fishing may be summarized as follows:

1. Recreational profit. (Value of the recreation obtained minus cost.)
2. Value of the catch as a foodstuff.
3. Earnings of industry on money spent by the sportsman.
4. Tax revenues (fishing licenses, excise tax on tackle, etc.).

"Evaluation of Fisheries in Determining Benefits and Losses from Engineering Projects," a recent Service report by Richard A. Kahn and George A. Rounsefell, provides examples of how to determine the value of the fisheries. The 10-page publication may be obtained from the Fish and Wildlife Service, Merchandise Mart, Chicago 54, Ill., by requesting Special Scientific Report No. 40.

Fish Budget

The average Tokyo (Japan) family spends 11.9 percent of its food budget for fish, according to Japanese Economic Statistics (January 1947).

By comparison, the United States urban family, in 1942, spent only 1.9 percent of its food budget for fish.

Arkansas Mussel Shell Industry

A study of the mussel shell industry, entitled "Fresh-Water Mussel Shells, the Basis for an Arkansas Industry" (Research Series No. 9) has recently been published by the Bureau of Research, University of Arkansas, Fayetteville, Arkansas. It gives a history of the industry and makes suggestions on the future possibilities for industrial utilization of mussel shells in this State. Excerpts from this report are available as Fishery Leaflet 246, entitled "Fresh-Water Mussel Shells." Copies of this leaflet may be obtained from the Fish and Wildlife Service, Merchandise Mart, Chicago 54, Ill.

Connecticut's Fishing Industry

The importance of Connecticut's commercial fishing industry is reported in Connecticut Progress, Volume 8, No. 2, February 1947, published by the State Development Commission. The brief report is well illustrated, and describes the part Stonington plays in helping to supply the New York market with fish.

Motorboat Regulations Revised

The United States Coast Guard recently issued Navigation and Vessel Inspection Circular No. 77 which revises the requirements for motorboats operated for pleasure

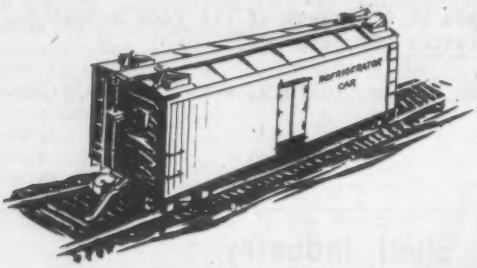
and commercial fishing purposes. The main changes are in the method of documentation and application for numbers for motorboats.

Motorboat regulations, the latest issue of which was on March 15, 1946, are being revised to include the changes listed in Circular No. 77.

Further information may be obtained from the Commandant, U. S. Coast Guard, Washington 25, D. C., or from any Officer in Charge, Marine Inspection, U. S. Coast Guard.

Iceless Refrigerator Car Tested by USDA

Tests conducted by the Department of Agriculture in cooperation with various industry groups, indicate that an iceless refrigerator car can maintain temperatures of approximately 0° F. under conditions of summer heat. This temperature, which cannot be reached by the ordinary refrigerator car, will maintain the prime quality of frozen foods.



The car in which the tests were conducted has 3-inch insulation and is equipped with a split-absorption system of refrigeration, an adaptation of a well-known method of refrigeration. Tanks attached to the underframe of the car hold the refrigerant, anhydrous ammonia, under pressure. Cooling is achieved as the ammonia moves from the tanks through a single regulating valve and expands in the cooling coils located in the ceiling of the car. When the ammonia has completed its refrigerating effect, it is finally taken up by water in absorber tanks also attached to the underframe of the car. There are no moving parts.

The tests, conducted in a car-testing laboratory at Potomac Yards, Alexandria, Va., were made with a car loaded with cartons of frozen tangerine segments.

During the 10-day test, the temperature of the frozen tangerines at the top of the load averaged from -4° to 1°. At the bottom of the load, temperatures ranged from -3° to 3°. Improved wall and floor racks, allowing a freer circulation of air, would undoubtedly narrow the spread between temperatures at the top of the load and those at the bottom of the load.

The load of tangerines was hard-frozen when placed in the car. The load was still hard-frozen when removed at the end of the test period.

Tariff Commission Import Studies

The United States Tariff Commission has compiled a series of tables showing United States imports for consumption of fishery products during the calendar years 1935-46.

The statistics shown in the tables for the earlier years were compiled for use during the war when imports from important European and Asiatic sources were practically eliminated. Imports from Canada and Newfoundland are shown separately because these two countries are producers of large exportable surpluses of fishery products and were the principal sources of imports during and since the war.

In terms of value the imports from Canada and Newfoundland accounted for 37 percent of the total in 1935, 75 percent in 1942, and 60 percent in 1946. Other important sources in 1946 were Norway, Portugal, Peru, Mexico, and Iceland. Japan and Italy were important sources of imports during the prewar period, but are at present relatively insignificant. On the other hand, the development of fisheries in some countries during the war, notably Peru, Chile, and Venezuela, has led to increasing imports from those countries.

Copies of the tables will be supplied without charge upon request from the Tariff Commission, Washington 25, D. C.

Food and Agriculture Organization

REGIONAL COUNCILS FOR THE STUDY OF THE SEA: On May 7, the Food and Agriculture Organization of the United Nations sent a memorandum to member governments entitled: "Proposal for the Establishment by Convention of Regional Councils for the Study of the Sea."

The memorandum follows:

1. This memorandum is circulated, in conformity with the provisions of paragraph 1 of Rule XXII of the Rules of Procedure, to give notice of the Director-General's intention to invite member governments to establish by convention, under the auspices of FAO, regional councils for the study of the sea.

2. The Constitution provides that "The Organization shall promote and, where appropriate, shall recommend national and international action with respect to ... the conservation of natural resources and the adoption of improved methods of agricultural production" (Article I, paragraph 2.), and that "the term 'agriculture' and its derivatives include fisheries, marine products, forestry and primary forestry products."

3. The Conference of FAO recommended at its first session that FAO should "encourage international forms of cooperation and management with a view to greater future utilization of fishery resources" and expressed the view that it was "preferable for any international action for conservation and management to be established on a regional basis." The Conference further recommended that FAO should "invite member nations to consider the desirability of arranging periodic conferences between regional authorities, including established national and international councils for the study of the sea; and lend all possible support to the development of international programs of cooperative research, and, wherever neces-

sary, of joint regulatory action on a regional basis to conserve and bring about the proper management of fishery resources." (Report of the First Session of the Conference, page 35.)

4. The Standing Advisory Committee on Fisheries, at its meeting at Bergen in August 1946, recommended "the establishment at as early a date as possible of regional bodies for starting and developing intensive programs of cooperative research and conservation of fisheries by the member nations concerned."

5. The regional method of approach has certain obvious advantages over the all-inclusive method. Although the seas are confluent, ecological zones within them differ and the problems of conservation and development differ correspondingly. The acquisition of knowledge of resources anywhere in the high seas may be of interest to all countries, but the scientific work of each country is mainly directed towards the study of neighboring waters and that country's interest in what happens elsewhere derives from any effect it may have on local fisheries.

6. Furthermore, relatively small groupings of countries based on a close community of interest are likely to be more successful in this field than larger groupings. Effective cooperation depends on ease of communication and on good representation in any consultive body. Both are more readily secured under a regional organization with a conveniently accessible center. If on the other hand it becomes desirable that any particular problem should be considered on a world scale, representatives of regional bodies can be called together for joint consultation as recommended by the Quebec Conference.

7. The functions of the proposed regional councils for the study of the sea would be:

(a) To formulate the oceanographic and biological aspects of the problems of conservation and development of the resources of the high seas, including consideration of questions relating to the natural history, distribution, migration and environmental relationships of fishery species; the size, extent and seasonal variations (in abundance) of fish populations; the effect of fishing operations; the most efficient method of obtaining maximum production without endangering future supply; effective methods of propagation; stocking; disease; and pollution control.

(b) To assemble available knowledge on these subjects.

(c) To suggest to governments how national programs of research may best contribute to filling gaps in such knowledge.

(d) When it is appropriate, to undertake cooperative research directed to this end.

(e) To make available, through publication, authoritative data derived from correlation of work conducted in the region.

(f) To consider and report upon such questions concerning the scientific aspect of the resources of the sea in each region as may be referred to them by other international authorities.

8. It will be clear that the proposed councils would be deliberative bodies whose duties would be limited to finding and reporting facts. It is not intended that they should be responsible for formulating regulations governing fishing in their respective regions. If the facts reported by a council indicated that such

measures were desirable, it would be for FAO itself to invite the nations concerned to consider in the light of the facts the desirability of concluding a separate convention under which appropriate action could be taken to govern the conduct of fishing operations.

9. With reference to item (d) in paragraph 7 above, it is unlikely that regional councils would be called upon to engage in forms of cooperative research requiring facilities or equipment beyond what can be provided by individual member countries, but if it proved desirable in the future for any council to procure on its own account facilities or equipment not otherwise available, this could be done by vesting the right of ownership or possession in FAO in accordance with its constitutional powers.

10. The establishment of a series of regional councils for parts of the high seas not now actively served by existing bodies is an aim that must be attained by stages. In an initial approach to the problem, however, it has been found necessary to consider it from the global point of view in order to achieve a provisional delimitation of regions. The regions suggested for consideration are set out below, with the idea that a start may be made in only two or three of these regions in the first place.

11. Proposed Regions:

(a) North Western Atlantic - The waters bounded by the parallel of latitude 30° north and the pole, and the meridian of longitude 30° west and the coasts of Canada and the United States.

Members concerned with territories in the Region:

Canada, Denmark, France, Newfoundland, (U.K.)
United States.

(b) South Western Pacific and Indian Ocean (South East Asia) - The waters bounded by the parallels of latitude 30° north and 60° south, and by meridians of longitude 180° east and 65° east.

Members concerned with territories in the Region:

Australia, China, France, India, Netherlands,
New Zealand, Philippines, United Kingdom,
United States.

(c) Mediterranean Sea and Contiguous Waters -

Members concerned with territories in the Region:

Egypt, France, Greece, Italy, Lebanon,
Portugal, Syria, Yugoslavia.

(d) North Eastern Pacific - The waters bounded by the pole and parallel of latitude of the Equator, and the meridians of longitude 120° east and 180° east.

Members concerned with territories in the Region:

Canada, United Kingdom, United States.

(e) South Eastern Pacific - The waters bounded by the parallels of latitude 34° north and 60° south, and the Western coasts of North America, Central America, and South America and the meridian of longitude 120° east.

Members concerned with territories in the Region:

Colombia, Chile, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Peru, United States.

(f) Western South Atlantic - The waters bounded by the parallels of latitude 30° north and 60° south, and the meridian of longitude 30° west and the Eastern coasts of North America, Central America, and South America.

Members concerned with territories in the Region:

Brazil, Colombia, Cuba, Dominican Republic, France, Guatemala, Haiti, Honduras, Mexico, Netherlands, Nicaragua, United Kingdom, United States, Uruguay, Venezuela.

(g) Eastern South Atlantic and Indian Ocean (African Area) - The waters bounded by the parallels of latitude 30° north and 60° south, and the meridians of longitude 65° east and 30° west.

Members concerned with territories in the Region:

Belgium, Egypt, France, Iraq, Italy, Liberia, Portugal, United Kingdom, Union of South Africa.

12. It is suggested that immediate consideration be given to the establishment of councils for the first three regions named in the above list: North Western Atlantic, South Eastern Asia, and Mediterranean. Draft conventions for those regions, together with the relative reports as required by paragraph 2 of Rule XXII, will be circulated as soon as possible. Meanwhile member governments are invited to study the general proposal, to supply any relevant information and, if they so desire, to make representations relating to the proposal.

* * * * *

ADVISORY GROUP REPORTS ON SALT FISH: The Advisory Group on Salt Fish which opened its meeting in Washington on April 21, concluded its discussions on April 25. Technical experts from 10 of the most important producung and importing countries attended the meeting, which was a preliminary one called to assist the Fisheries Division of the Food and Agriculture Organization of the United Nations in preparing for the comprehensive study on salt fish recommended last January by the Preparatory Commission on World Food Proposals.

PACKING COD FISH

The group felt that the first step should be to obtain fuller and better coordinated statistical information on the salt fish industry, and made preliminary arrangements for gathering the required information that interested governments will submit to FAO. The information will be concerned with both production and consumption and will embrace questions on fishing, processing, and the distribution and consumption of salt fish with special reference to cod and related species.

From these data, FAO will prepare a report in June, which will be submitted to a Study Group next fall. It is hoped that meeting will be able to provide

sufficient information to member governments to assist them in deciding whether a commodity agreement on salt fish is desirable. If this proves to be the case, FAO in cooperation with the proposed International Trade Organization might call a world conference on salt fish.

The Committee reviewed the recent history of the salt fish industry, and in particular the chronic depression of the prewar years. In the two decades preceding World War II, prices of salt fish, which had sharply declined in 1920, remained at such a low level that producer subsidies were necessary. During the war years, prices rose to such an extent that certain consuming countries found it necessary to subsidize consumption.

Dr. D. B. Finn, of the FAO Fisheries Division, acted as chairman of the meeting, with Mr. B. S. Dinesen as vice-chairman. The other members attending were:

Mr. I. S. McArthur, Chief,
Economics Division, Dept. of Fisheries,
Ottawa, Canada

Mr. M. B. Bursey,
Trade Commissioner,
New York, N. Y.

Mr. Nils Jangaard,
Fisheries Attache,
Norwegian Embassy,
Washington, D. C.

Mr. A. W. Anderson, Chief,
Division of Commercial Fisheries,
Fish and Wildlife Service,
U. S. Dept. of the Interior,
Washington, D. C.

Dr. Paulo Froes Da Cruz,
Agricultural Attache,
Brazilian Embassy,
Washington, D. C.

Mr. J. H. de Morias,
Consul-General for Portual in Nfld.,
St. John's, Newfoundland.

The Honorable Thor Thors,
Minister of Iceland,
Washington, D. C.

Mr. E. G. Reid,
Newfoundland Fisheries Board,
St. John's, Newfoundland

Mr. Per Sandven,
Norwegian Embassy,
Washington, D. C.

Mr. J. M. D. Scorrer,
Hawes & Company (London) Limited,
Imperial House, London, England.

Colonel R. H. Fiedler,
Special Asst. to the Director of the
Fish and Wildlife Service,
U. S. Dept. of the Interior,
Washington, D. C.

Engineer Higino De Matos Queiroz,
President, Regulating Committee on Cod
Fish Commerce,
Lisbon, Portugal.

Mr. J. M. Le Touze,
Paris, France.

* * * * *

MINIMUM STANDARDS OF QUALITY: On May 6, the Food and Agriculture Organization of the United Nations forwarded a memorandum to member governments entitled "Minimum Standards of Quality for Fishery Products."

The memorandum follows:

Member governments will recall that at the first session of the Conference of FAO the Fisheries and Marketing Committees discussed the desirability of establishing certain minimum standards of quality for fishery products entering into international trade. After consultation with the Standing Advisory Committee on Fisheries, it has been decided to place this matter on the agenda of the third session of the Conference, which is to open in Geneva on August 25, 1947.

Lack of uniformity of quality has undoubtedly been a serious impediment to the flow of international trade in fishery products and, while it is realized that the establishment of an international code for certain fishery commodities presents difficult problems requiring careful study and could not in any case be undertaken immediately, it is thought desirable to initiate the necessary preliminary discussions without further delay.

It is also realized that, even though a limited code were evolved and adopted, there would be no compulsion on exporting countries to follow it, but it is believed that the mere existence of international agreement on minimum requirements would have a useful moral effect.

The Director-General would accordingly be grateful if the appropriate departments of your Government could be informed of his intention to bring this matter before the Conference at its forthcoming session.

Wholesale and Retail Prices

Prices for all foods, at the wholesale level, increased 2.0 percent from January 18, 1947 to February 15. During the same period, retail prices declined 0.8 percent, according to the Bureau of Labor Statistics, Department of Labor.

The average retail price of fresh and canned fish declined 4.6 percent, while fresh and frozen fish declined 8.0 percent.

The retail prices between February 15, 1947 and February 13, 1946, increased 30 percent for all foods with canned pink salmon showing the maximum increase of 47 percent.

Wholesale and Retail Prices

Item	Unit		Percentage change from--	
Wholesale: (1926 = 100)		Feb.15,1947	Jan.18,1947	Feb.16,1946
All commodities	Index No.	143.1	+1.6	+33.5
Foods	do	160.9	+2.0	+49.0
Fish:		Feb. 1947	Jan. 1947	Feb. 1946
Canned salmon, Seattle:				
Pink, No. 1, Tall	$ per doz. cans	3.097	-3	+52
Red, No. 1, Tall	do	5.363	0	+45
Cod, cured, large shore, Gloucester, Mass.	$ per 100 pounds	15.00	0	+11
Herring, pickled, N. Y.	¢ per pound	12.00	0	0
Salmon, Alaska, smoked, N. Y.	do	35.00	0	0
Retail: (1935 = 100)		Feb.15,1947	Jan.18,1947	Feb.13,1946
All foods	Index No.	182.3	-0.8	+30.6
Fish:				
Fresh and canned	do	258.7	-4.6	+14.0
Fresh and frozen	¢ per pound	39.8	-8.0	+ 5
Canned salmon:				
Pink	¢ per pound can	36.6	+4.0	+47
Red	do	58.8	-0.1	+37

FOREIGN FISHERY TRADE

Imports and Exports

GROUNDFISH IMPORTS: Imports of fresh and frozen groundfish (fillets, steaks, etc., of cod, haddock, hake, cusk, pollock, and rosefish), within quota limitations, under the reduced tariff provided under trade agreements, totaled 2,379,332 pounds during March, according to a preliminary report from the Bureau of Customs, Treasury Department.

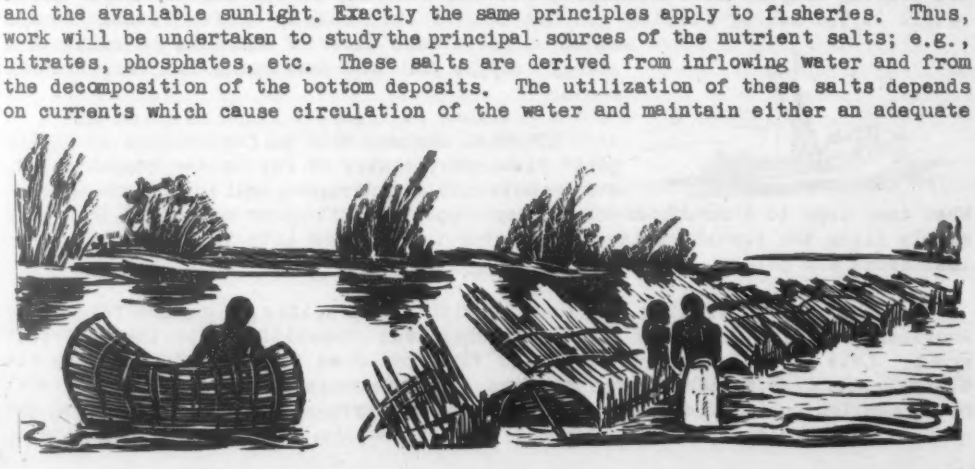
Country	1947		1946	
	March	3-month Total	March	3-month Total
Canada	1,291,972	3,662,728	3,196,364	8,920,812
Newfoundland	592,360	1,109,750	382,766	1,037,047
Iceland	495,000	584,402	1,816,350	2,417,450
Total	2,379,332	5,356,880	5,395,480	12,375,309

Africa

FISHERIES RESEARCH LABORATORY IN UGANDA: A Fisheries Research Laboratory is now being built at Jinja. When completed, it will accommodate a team of scientists, each of whom will be a specialist in his own field, according to a report received by the American Consulate General, Nairobi, Colony of Kenya, Africa.

The best use of the African lake fisheries can only be made after assessing the potential productivity of the various waters, and then encouraging the African fishermen to use methods which will give a sustained yield both for their own consumption and for trade beyond the lake areas.

The first part of the Laboratory's program can only be achieved by studying those factors which determine productivity. In agriculture and animal husbandry, productivity is determined by the texture and chemical composition of the soil and the available sunlight. Exactly the same principles apply to fisheries. Thus, work will be undertaken to study the principal sources of the nutrient salts; e.g., nitrates, phosphates, etc. These salts are derived from inflowing water and from the decomposition of the bottom deposits. The utilization of these salts depends on currents which cause circulation of the water and maintain either an adequate



or inadequate concentration in surface waters where the light is sufficient for plants to develop. Plants include not only submerged and rooted vegetation, but the far more important microscopic plants which live suspended in the water or grow up as an encrusting film on the woods, stones, or mud of the lake down to depths where there is sufficient light.

Some fish feed directly on these smaller plants. More usually, however, fish feed on other animals. Therefore, it is necessary to study these animals--insect larvae, snails, etc.--which feed on the plants and are the principal food of the fish.

Work will, of course, be done at the same time on the habits and life histories of the fish themselves and on their distribution within the lake. The study of the fish alone will be a considerable undertaking as there are nearly 200 different varieties of fish in Lake Victoria.

Advice based on the Laboratory's investigations will be given to the African fishermen through the proposed Lake Victoria Fishery Board.

Costa Rica

FISHERIES: Tuna: The Gulf of Lower California under Mexican jurisdiction and the Gulf of Nicoya in Costa Rican waters are among the few places in the world where sardines and anchovies can be found in sufficient quantity to supply live bait for the tuna fishing fleets, according to the American Embassy at San José, Costa Rica, in its report dated March 31, 1947, on the economic developments in Costa Rica during 1946. Boats out of San Pedro, Calif., come down to Puntarenas, catch bait in the Nicoya Gulf, and then range the waters outside for hauls of tuna. Some of the best grounds are off the shore of Cocos Island, owned by Costa Rica, and it is not uncommon for the fleets to proceed south to the Galapagos Islands in search of the tuna schools.

Once they have a load of fish, they can either pack it in ice or brine and return to the home port in California, or turn it over to an American freezing and packing company in Puntarenas. In the latter event, they can bait up and return to the nearby fishing grounds for another catch. A few vessels remain based on Puntarenas most of the time to maintain a steady supply for the American plant referred to above.

All that has been said so far relates to "bait-boat" fishermen, mostly of Portuguese racial stock, who use nets only when trapping bait in inshore waters. When they come to a school of tuna, they dump live bait close overboard, and literally fling the inrushing large fish over their heads into the boat with barbless hooks and poles.

Another way of fishing for tuna is with purse seines, a method favored by Americans of Dalmatian stock who are in ceaseless competition with the bait-boat group. Late in 1945, one purse-seiner ventured down from California with his boat and came into Puntarenas for supplies. His appearance gave rise to an official order denying port and customs facilities to any purse-seine fishing craft on the ground that seining was destructive of the fish supply in jurisdictional waters.

The vessel left the vicinity without much ado, and nothing was heard of the seine fishermen again until January 1947, when a mother ship, the Pacific Explorer, put into the Gulf of Nicoya, ready to service the seine fleet and refrigerate its catch.

To resolve the controversy which is now in full progress over fishing rights and methods, bait fees, customs procedure and other phases of the industry, the government is holding administrative hearings to enable both sides to present their briefs. The prohibition against seine boats is in suspense. New and more comprehensive legislation will probably be the end result. Meanwhile the rival factions are strenuously campaigning against each other in the San José press.

The tuna freezing plant in Puntarenas dates from 1935, while the canning factory associated with it began to produce in 1942. The table of tuna exports below traces the industry's progress for the last decade.

Tuna Fish: Exports from Costa Rica, 1935-1946

Year	Fresh[1]		Canned		Year	Fresh[1]		Canned	
	Gross kilos	Dollars	Gross kilos	Dollars		Gross kilos	Dollars	Gross kilos	Dollars
1937	2/ 126,170	19,250	-	-	1942	1,066,294	117,703	7,812	4,058
1938	3,363,967	453,787	-	-	1943	450,673	73,078	20,675	20,092
1939	3,393,300	413,441	-	-	1944	863,994	413,182	10,454	9,587
1940	1,910,582	244,432	-	-	1945	651,190	112,759	226,515	185,167
1941	837,811	147,920	-	-	1946[3]	1,281,000	202,000	321,000	311,000

1/Including only that cleared through customs; fish caught offshore and carried direct to California would not show in this tabulation.
2/This was the first year exports were made.
3/Preliminary.
Source: Compiled from data of the Dirección General de Estadistica.

Fish brought into territorial waters by the small vessels and transferred to the mother ship pass through customs in the same manner as that delivered to the refrigerating plant on shore. If the Pacific Explorer remains within Costa Rican jurisdiction until filled, and returns for more, the 1947 export statistics for fresh tuna should appreciably exceed those of the last few years.

Sharks: Extraction of the livers from sharks began to be reflected in Costa Rican export statistics in 1943, during which year, 147 metric tons were shipped with a declared value of $81,890. Exports in 1946 were less in volume (105 tons) but almost as great in value ($79,000). Shark fishing is conducted almost entirely from Puntarenas, using porpoise for bait.

The Costa Ricans have not yet acquired a taste for shark meat, nor do they bring the carcasses in for fish meal or fertilizer.

Turtles: In 1946, exports of live turtles amounted to 127 metric tons valued at $5,000. Turtles ranked 21st among the export commodities.

Ecuador

MOTHER SHIPS PERMITTED: The use of mother ships for fishing in Ecuadoran waters is permitted, according to the terms of an Executive Decree signed by the President of Ecuador on January 17, 1947, according to a dispatch from the American

Embassy, Quito, Ecuador. This step was taken when it was learned that foreign companies, interested in fishing in Ecuadoran waters, planned to use mother ships.

Under the terms of the decree, the following annual fees are payable by mother ships:

Consular Matriculation, Annually	$300.00	Second Trip	$8.00
First Trip	9.00	Third and Subsequent Trips	7.00

The above payments are stated in American dollars. The Central Bank's effective selling rate for the dollar is 15.04 sucres, its effective buying rate is 13.40 sucres.

It is further provided, under the Decree, that the mother ship will remain at the port of San Cristobal, while actual fishing activities are engaged in by the smaller fishing boats, for the period of time set forth for the voyage.

A third provision states that the Ecuadoran Consul concerned will write, on the reverse of the fishing permit of the mother ship, the declaration of the captain or agent of the ship, and the name and net tonnage of each of the fishing boats accompanying the mother ship. It is also stated that the name and registered tonnage of the mother ship will be noted on the registrations and permits of each of the smaller fishing boats.

The Ministers of National Defense, Social Welfare, Treasury, and Economy are charged with the execution of this Decree.

France

FISH INDUSTRY ON ST. PIERRE AND MIQUELON: Early in March, a Newfoundland newspaper reported on the subject of the expansion of the fresh fish industry on the French islands of St. Pierre and Miquelon as follows:

ST. PIERRE TO ENTER FRESH FISH INDUSTRY ON BIG SCALE

Government of France Makes Sizable Loan for Reconstruction
Cold Storage Plant and Building of Trawlers

The French islands of St. Pierre and Miquelon will this year launch out in the fresh fish industry on an extensive scale. It is hoped that the industry will provide employment for most of the islands' 4,000 population.

In conversation with a St. Pierre businessman a reporter was advised that the Government in France have voted an amount equivalent to about $5,000,000 to set up the fresh fish industry on the island. It is hoped that this new enterprise will remedy the existing problem of unemployment which has seriously affected the St. Pierre economic set-up in recent years. During the colourful days of rum running St. Pierre enjoyed an era of prosperity from smuggling operations. Today, the St. Pierrois are compelled by circumstances to return to the occupation of their forefathers--fishing.

At present, workmen are engaged at St. Pierre making extensive alterations to the old cold storage plant there. The entire plant is being remodelled, and will be equipped with the latest in quick, or sharp freezing apparatus. Seven new modern,

fast, Diesel driven trawlers are under construction at American shipbuilding yards and will soon be delivered to the Government at St. Pierre. These trawlers will operate on the Grand Banks and will make weekly trips between the fishing grounds and the fish plant, where the fish will be sharp frozen and later exported in refrigeration ships to France.

We are also advised that trawlers fishing from France will use St. Pierre as a base for their operations this season. Ten trawlers operated from France on the Grand Banks last year, but 28 ships are under construction at the present time and will probably be in operation before the end of the current fishing season. Part of the catches of the trawlers from France will be landed at St. Pierre to be shipped to France in the autumn.

It is expected that the new plant at St. Pierre and the added business provided by the trawlers from France will solve the unemployment situation on the island and provide the inhabitants with much needed work and earnings.

Mexico

NEW MEXICAN ABALONE REGULATION: The following is a translation and condensation of an Order published in the Dairio Oficial of March 14, 1947, which effects a new regulation for the various species of abalones of Lower California:

1. It restricts the taking of abalones to those cooperatives which have previously been in operation. If the abalones prove to be sufficiently abundant, other cooperatives may be permitted to fish.
2. The abalones taken must be offered first to the established canneries. They must also be offered in a certain percentage which will be fixed by the Ministry of Marine, to those cooperatives filleting them for Mexican markets. No other use of abalones is permitted.
3. The abalone beds are to be surveyed and the production is to be limited accordingly.
4. Until the surveys have been completed, the cooperatives must limit their fishing activities to the zone in which their legal residence occurs. For this purpose Lower California is divided into three zones.
5. The shore plants are permitted to use floating plants in conjunction with the shore plants. The floating plants cannot operate within a radius of 120 miles of a shore plant.
6. The amount of abalones to be taken from each zone will be fixed by the Ministry of Marine and will be based upon the average catch of the past five years.
7. Closed seasons are established from January 15 to March 15.

Newfoundland

SUMMARY OF CURRENT ECONOMIC INFORMATION: The Office of International Trade, U. S. Department of Commerce, has issued a report on Newfoundland, with particular emphasis on geographic and economic facts. Based on reports by the Foreign Service of the United States, it is a comprehensive, though brief, outline containing information of interest to anyone having business contacts with Newfoundland.

Copies may be obtained from the Superintendent of Documents, Washington 25, D. C., or any field office of the Department of Commerce. The price is 5 cents.

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REVIEW OF NEWFOUNDLAND'S 1946 FISHERIES SEASON: The cod fishery has long been the dominant industry of Newfoundland. During the war, newsprint for a time superseded the cod fishery from the export angle, as large numbers of men turned from the fisheries to join the armed services and to engage in work on American and Canadian military bases in Newfoundland. During the past few years, this trend has been gradually reversed, and by 1945 the fisheries again constituted the leading export industry, according to the American Consulate General, St. John's, Newfoundland.

In 1946, the catch of codfish approximated that for the highly successful 1945 season. The frozen fillet industry, after rapidly expanding in 1944 and 1945, leveled off, production falling a little short of the record 1945 figure. The herring industry, estimated largely by UNRRA orders, continued to flourish, production well exceeding the 1945 figures. Other fisheries, including sealing, lobsters, salmon, and whaling, generally compared favorably with 1945. Exports of fish oils exceeded those for 1945.

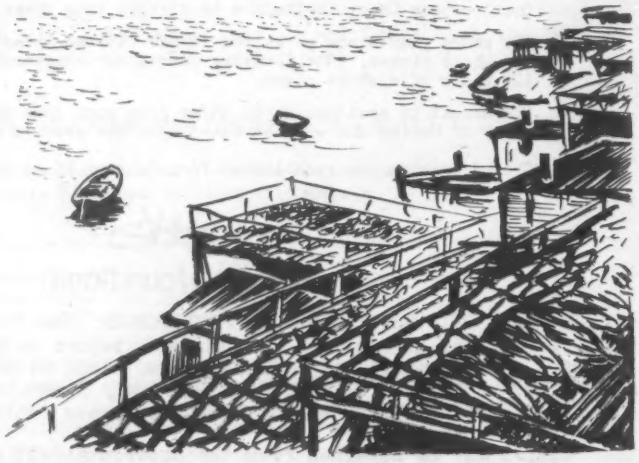
SALT CODFISH: Production: The estimated quantity of codfish salted during 1946 was 110,604,256 pounds, about the same as the production of 1945 (106,984,304 pounds), according to the Newfoundland Fisheries Board. Final figures for the 1946 season follow (in pounds):

Inshore fishery-	72,713,872
Deep-sea " -	15,250,592
Labrador " -	22,639,792
Total	110,604,256

In 1945, production was broken down as follows (in pounds):

Inshore fishery-	71,848,224
Deep-sea " -	14,294,560
Labrador " -	20,841,520
Total	106,984,304

An estimated 25,892 fishermen engaged in the fisheries during 1946, compared with about 24,836 in 1945, and 22,400 in 1944.



NOTE: All values cited in this report are in Canadian dollars. $1.00 Canadian = $1.00 U.S. The source of the tabular data in most instances is the Newfoundland Fisheries Board. One hundredweight (cwt.) = 112 pounds. One quintal = 112 pounds. One imperial gallon = 1.20094 U.S. gallons.

For the second successive year, the trap fishery in some districts, particularly on the North East Coast, was extremely poor. However, a good fall fishery offset this to a considerable extent. Unfortunately, the Labrador fishery was again somewhat disappointing. The deep-sea fishery was well up to average.

Exports: During 1946, exports of salt codfish reached a figure of 110,331,872 pounds--about the same as the amount for 1945 (111,844,768 pounds). These may be broken down by countries of destination as follows (in pounds):

Country of Destination	1946	1945
Spain	18,577,888	27,010,816
Portugal	18,074,448	15,441,664
Brazil	5,216,960	4,676,224
United States	940,464	611,856
Canada	310,800	452,032
Jamaica	10,595,200	11,368,000
Barbados	1,743,392	2,102,912
Trinidad	1,411,200	1,880,704
Puerto Rico	16,205,280	19,145,168
Cuba	473,088	328,496
Italy	20,524,784	12,186,608
Greece	8,388,352	8,533,056
Sundry West Indies	5,591,040	5,870,704
Other Sundry Markets	2,278,976	2,236,528
Total	110,331,872	111,844,768

In addition to the above indicated exports of dried salt codfish, 94,150 cwts. of saltbulk were exported during 1946, compared with 75,622 cwts. in 1945. These exports may be broken down by countries of destination as follows (in cwts.):

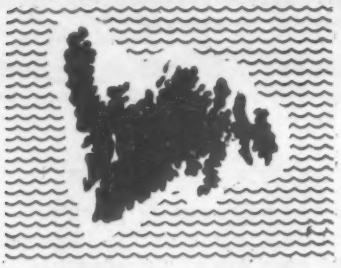
Country of Destination	1946	1945
United Kingdom	21,017	37,622
United States	39,340	35,216
Canada	33,793	2,784
Total	94,150	75,622

Prices: Early in 1946, representatives of fishermen's organizations again met with the Marketing Administrative Committee and the Fisheries Board to discuss the question of prices which might be paid to fishermen for the 1946 production. After a thorough examination of the position, it was agreed that no prices should be fixed and that these be left for negotiation between individual fishermen and merchants, it being understood that the removal of the wartime-enacted export levy of 25¢-50¢ per quintal on salted fish would automatically mean proportionate increases over the prices paid in 1945 to fishermen. (This export levy had been collected during the war years by the Government, and was discontinued in July 1946. The levy ranged from 25¢ to 50¢ per quintal, depending upon the type of cure.) The Government, on the other hand, raised the normal export levy on salt codfish, which had been in effect long before the war, from 2¢ to 5¢ per quintal. Prices obtained by exporters were the same as in 1945.

Foreign Fishing on the Grand Banks: French and Portuguese vessels have been more active in fishing off the Grand Banks. Such foreign fishing, of course, all but disappeared during the war, but it is now resuming its prewar importance.

French vessels in particular have enjoyed a considerable increase in fishing on the famous Newfoundland Grand Banks. During 1946, ten French trawlers engaged in this fishery, compared with only two during 1945. According to the French Consul, the catch during 1946 compared favorably with any prewar year. The leading vessel

of the 1946 French fleet took to France 53,000 quintals (about 5,936,000 pounds) of salt codfish, according to the Consul.



Six trawlers from Portugal prosecuted the fisheries off the Grand Banks in 1946, the same number as in 1945. In addition, 49 smaller vessels engaged in the Grand Banks fishery, about the same number as in 1945.

FROZEN CODFISH: This important and relatively new branch of the cod fishery maintained nearly the high production level reached in 1945. At the beginning of the year it was feared that the production of frozen cod fillets might have to be reduced, as it appeared likely that sales to the United Kingdom Ministry of Food would be much less than last year. Although this proved to be the case, and only 8,541,120 pounds were sold to the Ministry, as compared with 19,500,000 pounds in 1945, fortunately a further sale of 4,480,000 pounds was made later in the year, through the Ministry of Food, to the Allied Control Commission in Germany. As a result of this and increased sales to the United States, exports of frozen cod fillets amounted to 32,657,261 pounds, compared with 33,880,925 in 1945.

Fifteen quick-freezing and three sharp-freezing plants operated during 1946, as in 1945--representing a capital investment of over five million dollars. Production of frozen fillets of all varieties amounted to 30,151,140 pounds, compared with 31,403,553 pounds in 1945. As in 1945, by far the greater part of the fillet production consisted of cod fillets, the break-down being as follows (in pounds):

Cod fillets	28,219,556
Haddock	1,561,540
Rosefish	148,215
Others	221,829
Total	30,151,140

During 1946, three dragger-type vessels were introduced in Newfoundland fishing. All were used in connection with the fresh fish industry. A leading fishery concern plans to add three new ships to its dragger fleet in 1947. The use of draggers bids fair to make obsolete the hook and line dory fishing methods--but in Newfoundland, old methods often die hard, and it will likely be some time before modernization is completed.

The following table shows exports of codfish fillets from Newfoundland during 1946, with figures for 1945 in comparison (in pounds):

Country of Destination	1946	1945
United Kingdom	13,118,260	19,258,963
United States	12,725,095	6,055,073
Canada	6,809,391	8,565,501
Bermuda	4,515	-
Australia	-	1,120
Portugal	-	268
Total	32,657,261	33,880,925

HERRING: UNRRA orders continued markedly to stimulate this now important branch of Newfoundland's fisheries. It may be recalled that in August 1945, it was announced that UNRRA contracted for 45,000,000 pounds (approximately 200,000 barrels of 225 pounds each); early in 1946 an additional contract was signed for

25,000,000 pounds (approximately 110,000 barrels). The second contract called for a price of 6¢ per pound U. S. funds, as compared with 7¢ in the original contract. In both contracts, the type of herring was hard-cured, split herring.

In May 1946, the Newfoundland Fisheries Board announced that the season for catching herring for the UNRRA contracts was extended to June 15, subject to the condition that the Board would order all packing to cease immediately in any area in which the advice of inspectors showed any signs of deterioration in quality.

Inasmuch as the second contract was not sought by UNRRA until relatively late in the season, and the Fisheries Board had imposed a quota system on herring packers in order to forestall possible overproduction, the total pack only reached a figure of 189,320 barrels. The pack of filleted, dressed, and other cures of herring amounted to some 66,120 barrels.

The 1945-46 fall-winter pack of Newfoundland Scotch cure herring amounted to 20,925 barrels, although a contract had been arranged for 25,000 barrels.

A contract was arranged by the Fisheries Board for the supply of up to 10,000 barrels of Scotch cure herring and 4,400 barrels of dressed and filleted herring from Labrador, but because of the poor fishery, only 1,148 barrels and 882 barrels, respectively, were packed.

For the 1946-47 season, a contract was made by the Fisheries Board for 33,000 barrels of Scotch cure herring, and negotiations were opened with UNRRA for packing for relief purposes.

The following figures, showing exports rather than production of herring, indicate the important extent to which UNRRA relief orders stimulated this industry (in pounds):

Newfoundland Scotch Cure Herring	5,591,535
Hard Cure Split Herring:	
UNRRA	42,597,130
Other	649,565
Filleted, dressed, and other cures	16,116,420

Of the total exports of Scotch cure herring and filleted, dressed, and other cures of herring, about 90 percent went to the United States.

Late in December 1946, the Fisheries Board announced that the packing of dressed and filleted herring would be prohibited on the West Coast and in Placentia Bay--the chief herring areas--from midnight December 31, 1946. This order was made because of the carry-over in markets abroad of substantial quantities of last season's pack and the renewed activity in the markets by other producing countries. Individual quotas, it was also announced, would be issued to packers for the quantity packed up to December 31, but no additional quotas would be issued until further notice. The Board stipulated as a condition of the granting of any license to export dressed and filleted herring in brine, that sales be made at or above the following prices, f.o.b. Newfoundland export point, payable in American funds

or Canadian equivalent; dressed, $15.00 per barrel; fillets, $20.00 per barrel; and skinned fillets, $26.50 per barrel. These prices are based upon a standard barrel containing 225 pounds net weight of fish.

The prices paid the fishermen for herring ranged from $2.50 a barrel to as high as $4.50 a barrel, with quotations generally holding to the lower figure.

SEALING: Twelve vessels, many of them small, prosecuted the sealfishery in 1946--having a net tonnage of 1,346 and crews totaling 352 men. The total catch was 34,241, valued at $119,993.00. The S. S. Eagle, the only steamer prosecuting the sealfishery, was responsible for a catch of 7,757 of these seals.

LOBSTERS: Exports of live lobsters showed an increase of over 400,000 pounds over those for 1945. Exports for 1946 were 2,581,537 pounds, compared with 2,177,728 pounds in 1945. Exports of canned lobsters amounted to only 193,487 pounds, showing that almost the whole volume of this trade is now in live lobsters. The total catch of lobsters for 1946 amounted to approximately 3,564,906 pounds, as compared with 3,454,119 pounds in 1945.

SALMON: Exports of chilled salmon increased by over one-half million pounds during 1946, but frozen salmon exports were slightly below the 1945 figure.

Comparative figures were as follows (in pounds):

	1946	1945
Fresh and Frozen	2,126,773	1,595,598
Pickled	124,000	106,000

Exports of canned salmon amounted to 6,200 cases, somewhat below the figure for 1945 (7,676 cases).

SQUID: The squid fishery was more successful than it has been for many years, and the demand for squid strong. In view of the demand and in order to protect export markets, a squid marketing group was formed at the request of the trade, to be operated on similar lines as the groups associated with the salt codfish trade. The Newfoundland Dried Squid Exporters Association, Ltd., came into being, and shipments were handled and sales made by them on behalf of licensed exporters who were permitted membership in the group. An amendment was made to the Squid Regulations under which all those intending to engage in the packing of dried squid are required to obtain a license from the Board. It is now mandatory that all squid exports be made by the new Association. Similarly to the marketing groups formed in recent years, sales are made on a pro rata basis, depending on the size of each member-producer's pack.

FISHERY SALT: Early in 1946, it was decided by the Government to discontinue its policy of controlling the importation of fishery salt. However, regulations were made fixing the maximum prices which could be charged by salt importers. It was because of this change of policy that the salt levy which had been charged previously on all exportations of salted fish and other products of the fisheries was discontinued on 1946 productions.

CANNED FISH: Newfoundland's experience in the past with canning plants has been unfortunate; instead of concentrating operations in a relatively few large plants, several hundred small-scale operators have attempted to open plants. A few have maintained high standards, but many others have sold sub-standard prod-

ucts, to the consequent detriment of all Newfoundland canners. The Newfoundland Fisheries Board has conducted a quiet but effective campaign during the past several years, with the result that several score small below-par operators have gone out of business.

During 1946, only six licenses were issued by the Board to can codfish, and an analysis of the various packs was made from time to time by the Fisheries Research Laboratory in order that faults could be rectified and markets thus protected.

Work continued during 1946 on the construction of a new canning factory, to be operated as a subsidiary of a Canadian company. The factory will largely confine itself to the canning of herring, and will be located at Petries Point, on the West Coast. This is the type of enterprise which the Fisheries Board is endeavoring to encourage--a modern factory equipped with the latest-type machinery, capable of producing an article which would build up a favorable reputation in export markets. It is expected that the plant will be in operation in the spring of 1947.

RESEARCH: The Newfoundland Industrial Development Board has continued research commenced three years ago on a new method for preserving fish without salt or freezing. The research scientist with whom the Board has corresponded represents this process as being economical and suitable for small and widespread operations. Progress made thus far has resulted in a commercial experimental plant being recently erected.

Several American parties interested in the possibilities of obtaining pearl essence from herring scales have also visited Newfoundland during the past two years, and preliminary steps have been taken in the possible erection of a processing plant in the Humber Valley area on the West Coast.

The Newfoundland Industrial Development Board has also obtained basic data concerning the possible conversion of fish wastes into fish meal (cost of equipment, plans for factories, etc.). These data have been submitted to various fish processing firms, but as yet none has found it possible to take any action in this matter.

Late in December 1946, a representative of a United States firm arrived in Newfoundland to investigate the possibilities of developing the scallop fishery on the West Coast. Large scallop beds are known to exist off the Bay of Islands and in the St. George's area, but Newfoundlanders do not appear to have developed a taste for them as in the United States.

LOCALLY BUILT MARINE ENGINES: The new industry started in 1944 for the manufacture of small marine engines for fishermen has continued to expand. During 1946, 73 7½-h.p. motors were shipped, bringing the total number of deliveries since the inception of the industry to 135.

PROSPECTS FOR 1947--COD FISHERY: The outlook is for a production of salt codfish in 1947 approximating that of 1945 and 1946. Some 24,600 men are expected to engage in the fisheries during 1947. This figure might be expected to change only if there should be an unanticipated recruitment of Newfoundland workers abroad or a sudden diminishment of employment on American military bases in Newfoundland--neither contingency being likely to arise.

Prices obtained by exporters for salt codfish during 1947 are expected to approximate those prevailing in 1946. It is strongly probable that prices paid to fishermen will again be left for negotiation between individual fishermen and merchants, and will find a level close to that of 1946.

Marketing difficulties largely prevented an expansion of the frozen cod fillet industry in 1946, and the same difficulties--on a perhaps greater scale--are forecast for 1947. Sales to the United Kingdom, which dropped from 19½ million pounds in 1945 to 8½ million pounds in 1946, may virtually disappear in 1947, as European fisheries continue to expand.

Local exporters probably rightly consider that the future of the cod fillet industry depends upon increased exploitation of the United States market. This in turn will largely depend upon tariff policies adopted by the United States Government, and upon the outcome of pending international trade negotiations.

The Committee on Fisheries of Newfoundland National Convention stated in part in its interim report on the cold storage industry:

> "Imports into the U. S. A. market, our main hope for the future, are subject to duty. A quota, available to Canada and Newfoundland, enters the U. S. A. under a preferential rate of 1-7/8¢ per pound. All over the quota is subject to 2½¢ per pound duty. Any increase in the duty would be disastrous, and it is probably that only with some definite long term arrangements for free entry or considerably reduced duty into the U. S. A. will it be possible to greatly expand this industry in Newfoundland, as expansion on any materially increased scale does not seem practical until this question of the U. S. A. tariff has been settled for years ahead ...".

Because of the general uncertainty with respect to the marketing of fillets, it is likely that there will be little or no expansion of the industry in Newfoundland in 1947--as was the case in 1946. Thus, while the industry unquestionably plays a role of importance in Newfoundland's economy, there is no immediate hope that it will develop to a point where it might challenge the salt cod fishery as the dominant industry of Newfoundland.

SUBSIDIARY FISHERIES: It is clear that the herring fishery has received its greatest impetus from UNRRA orders, and these will eventually disappear. The 1947 outlook, however, was brightened when it was announced by the Newfoundland Fisheries Board early in January that a new contract for 50,000 barrels (11,250,000 pounds) of split herring had been closed with UNRRA. The herring is to be of the same type as previously supplied by Newfoundland, and is to be packed in the first four months of 1947. The price to be paid is 6¢ per pound, U. S. funds, f.o.b. steamer at ocean ports in Newfoundland. Late in January the Fisheries Board allocated quotas to herring packers, similar to the procedure adopted in previous years.

The herring industry is likely also to be stimulated by the canning factory now being constructed on the West Coast.

The sealfishery in 1947 will have the benefit of a government aerial survey of the icefields, to assist the seal fishing fleet in spotting seals and reporting general conditions of ice. This service is scheduled to go into operation on February 20, 1947, and will continue for approximately one month. The operational base will probably be at Gander. A Lockheed type two-engine plane

will be used and chartered from the Maritime Central Airways, Charlottetown, Prince Edward Island.

Plans to inaugurate an air freight service for the purpose of transporting fresh lobsters to the Canadian and American markets have met with difficulties owing to the fact that lack of road facilities makes it impracticable to have the lobsters collected and routed to a central locality. It is not certain, at present writing, that this will develop into a successful venture during 1947.

* * * * *

NEWFOUNDLAND'S FISH OILS, 1946: Newfoundland's production and export of fish oils in 1946 were confined, as usual, to the following types, in the order of importance: common cod oil, refined cod liver oil, whale oil, sperm oil, seal oil, herring oil, poultry oil, and dogfish oil, according to the American Consulate General, St. John's, Newfoundland.

The highlights of the 1946 season were as follows:

1. A 26 percent increase in cod liver oil (medicinal) production and exports, with the latter moving largely to the United States market at highly satisfactory prices.

2. The selling of a crude grade of medicinal cod liver oil to buyers in the United States, for the extraction of the vitamin A content--the first time Newfoundland cod liver oil has been handled for such a purpose, at least on a large scale.

3. A more-than-100 percent increase in the price of common cod oil exports to the United States, following the removal of ceiling prices.

4. A doubling of exports of whale oil, going by allocation largely to Canada.

5. A 70 percent increase in exports of seal oil, reflecting the partial revival of the once highly important seal fishery.

6. The failure to register any substantial production of herring oil.

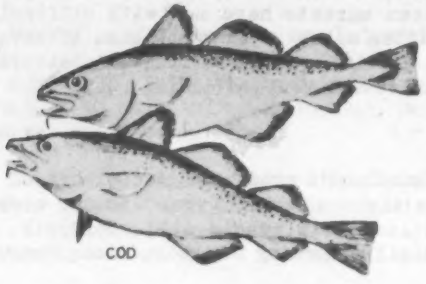
PRODUCTION: No department or agency of the Newfoundland Government maintains complete statistics on the production or consumption of fish oils. The consumption of fish oils in Newfoundland, however, is stated by the Newfoundland Fisheries Board to be relatively unimportant, almost the entire production being exported. Figures covering exports of fish oils, therefore, give a reasonably accurate picture of production (see EXPORTS). The discussion in this section will therefore largely be confined to a consideration of important factors with respect to production, and will include statistical estimates where available.

Cod Oils: The production of cod oils, of course, is ultimately dependent upon the catch of codfish,[1/] but production of cod liver oil in Newfoundland is limited by the lack of a large home market and by a low vitamin D content. An additional important limiting factor is the small supply of oil due to the methods of catch. While in other countries liver oil is produced on board trawlers and

1/ See previous article "Review of Newfoundland's 1946 Fisheries Season" for production of codfish.

NOTE: One imperial gallon = 1.20094 U.S. gallons. Sources of data: Newfoundland Fisheries Board, Department of Natural Resources, oil exporters.

later refined, in Newfoundland this has not been possible owing to the small size of schooners used (rarely above 200 tons and for the most part less than 100 tons). Consequently, cod liver oil factories in Newfoundland depend strictly on reliable supplies of shore codfish, brought to shore as early as possible after the catching, practically within a few hours. Newfoundland's cod liver oil industry is thus run in conjunction almost entirely with the shore fishery, and factories are located in the coastal areas in which the shore fishing is best and most dependable.



COD

The export market price of refined oil has been an important factor in determining the production each season of refined cod liver (medicinal) oil produced in relation to the amount of common cod oil (largely for tanners) produced. During the early part of 1946, the export market price of refined cod liver oil was at a high level, and partly for this reason the ratio of refined oil produced during 1946 was greater than in 1945.

Herring Oil: Two factories only have been responsible for Newfoundland's herring meal and herring oil production. Both of these factories were erected in 1941, and both commenced operations in 1942. The factory at Bay of Islands has been responsible for the greater part of Newfoundland's production and export of herring oil. In September 1944, however, this factory was destroyed by fire. As a result, exports of herring oil fell off from 405,937 imperial gallons in 1944 to 21,734 imperial gallons in 1945. However, the factory was quickly rebuilt, and resumed operations in 1946. The same managing interests also built a new plant at Belleoram, Fortune Bay, which came into operation in mid-1946. Production was limited in 1946, however, amounting to 4,785 imperial gallons. This was due to the failure of the new and rebuilt factories to get into production sufficiently early in the herring season.

Whale and Sperm Oil: The whaling industry has been prosecuted much more intensely in recent years than before the war. Six boats operated in 1946, compared with six during 1945, four in 1944, three in 1943, and only one for each of the three prior years. Two companies were responsible for Newfoundland's export of whale oils in 1946, as in 1945.

The 1946 season was highly satisfactory. The total catch for 1945 was 393 whales, the largest in years. In 1946, the total catch was even higher: 529 whales.

The growing importance of the whaling industry for Newfoundland is illustrated by the following table, setting forth the production of whales and whale oil (including sperm oil), during the six years 1941-46, inclusive:

Year	No. Whales Caught	Imperial Gallons Oil Produced	Year	No. Whales Caught	Imperial Gallons Oil Produced
1941	72	74,200	1944	264	380,541
1942	72	87,720	1945	393	517,750
1943	152	247,040	1946	529	760,949

Seal Oil: Newfoundland's seal fishery, although of very considerable importance up to the war period, has until recently steadily declined. For purposes of com-

parison, it may be observed that during the five-year period 1935-39 production of seal oil amounted to over 3,000,000 imperial gallons, an average of over 600,000 imperial gallons per year. Production during 1942-44 stood at less than one-tenth this figure. In 1939, the most disappointing prewar year since 1932, only seven steamers engaged in the sealfishery. During the war, the sealfishery all but disappeared. In 1941, four steamers engaged in the sealfishery; in 1942, there were three; in 1943, none; in 1944, one; and during the 1945 season, none.

In 1946, only one steamer prosecuted the sealfishery, but production of seal oil reached the figure 129,892 imperial gallons, compared with 77,942 in 1945. This was largely due to the fair degree of success with which auxiliary and motor-vessels met in prosecuting the sealfishery.

The decline in the importance of the sealfishery has been principally due to three factors: (1) the disruption of activities brought about by the war; (2) high costs of production, in the form of high customs assessments on equipment and a relatively high internal profits tax; and (3) marketing difficulties--in particular, an all-but-prohibitive customs barrier raised by the United States Government a decade ago, in the form of a processing tax. Concerning the last point, it may be observed that since the levying of the American processing tax, the United States market has nearly disappeared, and that prior to the levying of this tax, more than 50 percent of Newfoundland's seal oil was exported to the United States.

CONSUMPTION: Virtually the entire production of fish oils in Newfoundland is exported, the volume of home consumption being unimportant.

EXPORTS: The following table compares exports of fish oils from Newfoundland for 1946 with exports for 1945 (calendar years in both instances) (in imperial gallons):

Type of Fish Oil	1946	1945
Common Cod	499,192	554,400
Refined Cod	421,400	332,558
Poultry	4,039	18,320
Whale	621,623	299,877
Sperm	56,241	-
Seal	131,768	77,942
Herring	4,785	21,734
Dogfish	48	-
Total	1,739,096	1,304,831

Most of the common cod oil went to the United States by allocation during both 1945 and 1946. In 1945, exports of refined cod liver oil were made largely to Canada, owing to sizable shipments for relief purposes. In 1946, the United States took most of the refined cod liver oil exports, relief orders playing a more unimportant role.

Exports of whale oil nearly doubled, Canada taking the larger part by allocation. The year 1946 found new markets opened in Finland, the Netherlands, and Czechoslovakia. Sperm oil exports were substantial owing to a fair production plus the carrying over of sizable stocks.

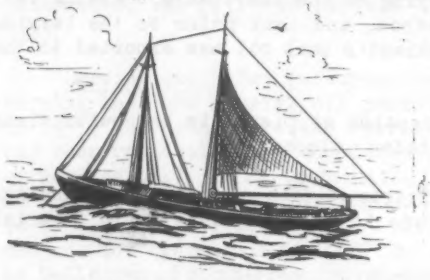
Exports of seal oil showed a 70 percent increase, reflecting the partial revival of the once important sealfishery. Canada was the largest market, by allocation.

Herring oil exports remained low owing to the failure of new and rebuilt plants to get into production sufficiently early in the herring season.

With the exception of cod liver oil, fish oil exports were governed largely by international marketing arrangements; reference in this connection should be made to the section of this report on "MARKETING."

STOCKS: Stocks of fish oils are not declared by producers or exporters to the Newfoundland Fisheries Board or any Government department. However, exporting is almost entirely handled by eight firms in St. John's, and it has been possible to make a careful canvassing of these firms in order to make a general comparison of the situation in 1946 as compared with 1945.

Stocks of common cod oil and cod liver oil at the end of 1946 were at the lowest level for at least a decade. Herring oil stocks were eliminated by the end of the year, it being noted that production was very small. Stocks of whale and sperm oils were low, and stocks of seal oil were negligible.



COD FISHING SCHOONER AT ANCHOR

In the case of common cod oil, the very low quantity of stock on hand at the end of the year was due to: (1) a small total production of all types of cod oil compared with prewar years; (2) an increase in the ratio of cod liver oil produced as against common cod oil; and (3) the maintenance of a strong demand for common cod oil--a demand which exceeded the supply. Common cod oil production has been perhaps the lowest for a hundred years.

With respect to cod liver oil, stocks have been low compared with last year primarily because exporters have sold at highly profitable prices, mainly to the United States.

Concerning herring oil, the absence of any stocks has been due to the lack of any substantial production during 1946. In the case of whale and sperm oils, stocks have fallen off largely because of a good demand for these oils, sales having been at least as easy as in 1945.

PRICES: Fish oil prices have been influenced and in many instances governed by international allocations and by price fixing. It may therefore be useful to review the more important of these factors which have appeared in recent years.

Import restrictions initiated by many countries during the early years of the war dislocated Newfoundland's fish oil trade, and for a while considerable difficulty was experienced in marketing the production. In 1942, this was met to some extent by the purchase by the United States Government of a large quantity of Newfoundland oil, but in 1943 no such sales were made. Through the Oils and Fats Committee of the Combined Food Board, an arrangement for the allocation of certain oils, including Newfoundland common cod oil, was made. Eventually, the

total supply of Newfoundland's cod oil of 1943 production was sold to the buying agency nominated by the Combined Food Board; namely, the Commodity Price Stabilization Corporation, Ltd. (United States).

During 1943 and the early part of 1944, the price of common cod oil was set at fixed amounts per imperial gallon. In May 1944, the marketing arrangement with the Commodity Price Stabilization Corporation expired; thereafter, exporters were free to make their own sales. It was generally felt, however, that some control of prices should still be exercised. Accordingly, the Newfoundland Fisheries Board issued in June minimum prices for cod oils. In 1945, restrictions with respect to minimum prices were lifted, and prices have been a matter of negotiation between buyers and sellers. For a time, in 1945 and 1946, ceiling prices in the United States were the determining factor in these negotiations. With the removal of ceiling prices in the United States, prices were determined, for the first time in years, by normal factors of supply and demand. Common cod oil exports to the United States were priced at 78¢-85¢ per U. S. gallon, c.i.f.,[2] United States currency in 1945, but commanded considerably higher prices early in 1946. With the removal of price controls late in 1946, the price jumped to nearly $2.00 per imperial gallon (over $1.60 per U. S. gallon), c.i.f., United States currency--more than double the price in 1945, and perhaps 500 percent or more above prewar prices.[3] (All prices quoted in this section are average prices for average quality unless otherwise stated.)

The sale of cod liver oil, unlike common cod oil, has never been channeled through government corporations; sales have been made direct to private buyers. During 1946, refiners paid fishermen an average of $1.90 Canadian currency per imperial gallon, well above the $1.75 paid in 1945. Exports of cod liver oil to the United States were priced at $1.85-$2.05, c.i.f., per U. S. gallon, United States currency. Top-grade (non-freezing) cod liver oil sold in 1946 at $2.70 per U. S. gallon, United States currency, c.i.f., compared with $2.30 in 1945.

Whale oil sold at a price somewhat higher than the $.759 per imperial gallon (Canadian currency) f.o.b. Newfoundland shipping point, prevalent in 1945. Seal oil exports showed a very substantial increase over 1945; in that year seal oil sold at 85¢-90¢ (Canadian currency) per imperial gallon, f.o.b., St. John's. In 1946, the price reached $1.22 per imperial gallon, c.i.f., New York, U. S. currency.

MARKETING: As indicated in the previous section, the marketing of common cod oil up to May 1944 was effected through the Commodity Price Stabilization Corporation, Ltd., in the United States and Canada. In May 1944, this arrangement expired, and exporters were left free to make their own sales, but at fixed prices. In 1945, restrictions with respect to minimum prices were lifted, and sales became entirely a matter of negotiation between buyers and sellers. In August 1945, the Oils and Fats Committee of the Combined Food Board allocated 200 tons of common cod oil to Canada, the balance going to the United States. A similar arrangement was made in 1946.

The sale of cod liver oil (medicinal) has never been subject to the arrangement described for cod oil. Owing to the satisfactory prices obtained for cod liver oil, no sizable stocks accumulated.

2/ c.i.f. - Cost, Insurance, Freight

3/ For convenience in reference, it is repeated that one imperial gallon = 1.20094 U.S. gallons. In considering the price differentials, adjustment should be made for the rise in the exchange rate of the Canadian dollar on July 5, 1946--from $1.10 to par in relation to the U.S. dollar. This lessens the apparent abruptness of many of the price rises in fish oils, but by no means offsets such rises.

On the recommendation of the Fats and Oils Committee of the Combined Food Board, it was agreed by the Newfoundland Fisheries Board, after consultation with the trade, that Newfoundland's 1946 production of whale and seal oils should be allocated to Canada--as was the case in 1945. Herring oil of 1946 production was allocated entirely to the United States--as in 1945. No exports of allocated oils have been allowed except by permission of the Newfoundland Fisheries Board.

Herring oil, whale oil, sperm oil, and seal oil have been marketed through the Commodity Stabilization Corporation, Ltd., to the United States and Canada. Certainty as to prices and sales has thus characterized transactions in these oils, as in the case of common cod oil up to May 1944. Herring oil has found a ready market owing partly to its use in the production of soaps, explosives, and ship paint. Whale oil has been used as an ingredient of certain types of explosives, of margarine, and of soaps.

OUTLOOK FOR 1947 SEASON: Local exporters of fish oils look forward with mixed optimism to the 1947 season. It is generally felt that the scramble for the world's limited supplies of fats and oils, which bid the prices of oil-bearing materials to record highs in 1946--despite allocations of the IEFC--seems likely to continue in 1947. Of course, sooner or later this condition will cease to exist; nevertheless, the outlook for 1947, taken as a whole, is for a season at least as successful as 1946.

The prospects for the local common cod oil industry is for a season marked by very high prices and profits early in 1947, followed by a price break of at least 60 percent, according to a large exporting firm of cod liver oils. Local exporters do not believe that present prices can hold, and, furthermore, they are of the opinion that production in Newfoundland and other cod oil producing countries will increase sufficiently to bring supply and demand more nearly into a normal balance. Production of all cod oils in Newfoundland, of course, will depend upon the catch of codfish; there are no special reasons apparent at present for anticipating much change from the 1946 season in this respect.

Concerning cod liver oil (medicinal), the outlook is for a season at least as good as in 1946. A leading cod liver oil concern in Newfoundland anticipates selling cod liver oil at $2.40-$2.90 per U. S. gallon, c.i.f., New York, U. S. currency, depending on quality. The 1946 season was strongly affected by sizable sales of a crude grade of refined cod liver oil to buyers who extracted the vitamin A for resale in capsule or other forms. This may continue in 1947, making an excellent market for low grade cod liver oil. Production difficulties alone may hamper the 1947 season. If the price of common cod oil continues high, refiners may have difficulty in persuading fishermen to sell steam-processed liver oil, rather than the sun-rotted oil used for common cod oil.

Exporters of other types of fish oils; i.e., whale oil, seal oil, and herring oil, look forward with optimism to the 1947 season. The demand is expected to be as strong as in 1946. Production of whale and seal oils, of course, will depend upon the degree of success which attend the whale fishery and the sealfishery, both highly speculative undertakings. At present writing, little can be said in this respect concerning the whale fishery. But early reports from the sealfishery have been most encouraging. Production of herring oil should rise abruptly as the Bay of Islands' plant goes into full production for the first time since 1944, and a new plant at Belleoram commences operations.

FEDERAL LEGISLATION, DECISIONS, ORDERS, ETC.

Food and Drug Administration

CANNED OYSTERS AND SHRIMP: The Food and Drug Administration announced on May 20 that the fees charged for the plant inspections of canned oysters and shrimp will be raised on July 1, 1947. For further information, inquiries should be addressed to the Food and Drug Administration, Federal Security Agency, Washington 25, D. C.

Department of the Interior

ALASKA FISHERIES REGULATIONS: Copies of Laws and Regulations for Protection of the Commercial Fisheries of Alaska, 1947, Regulatory Announcement 19, issued by the Department of the Interior, are now available. The laws and regulations contained in this publication supersede the laws and regulations published in the Department of the Interior Regulatory Announcement 15, effective March 22, 1946, as amended.

Regulations in Regulatory Announcement 19 became effective January 25, 1947.

Copies of this publication may be obtained, upon request, from the Director, Fish and Wildlife Service, Chicago 54, Ill., or from the headquarters of Fishery Agents in Alaska listed below:

Anchorage	Craig	Ketchikan	Wrangell
Chignik	False Pass	Kodiak	Yakutat
Cordova	Juneau	Naknek	

* * * * *

ALASKA SHRIMP REGULATIONS: The following change in Part 220--Subchapter Q "Alaska Commercial Fisheries," signed by Warner W. Gardner, April 14, 1947, appeared in the Federal Register on April 19, 1947:

SHRIMP FISHERY

Section 220.16 is hereby amended to read as follows:

220.16 Closed season, shrimp fishing. Commercial fishing for shrimp is prohibited in the period from February 1 to April 15 and from July 15 to September 30, all dates inclusive, in the waters of the Stikine district, the Eastern district east of the longitude of Cape Fanshaw, and in the Summer Strait district north of the latitude and east of the longitude of Point Baker. All waters of Duncan Canal are closed to shrimp fishing throughout the year. (Sec. 1, 44 Stat. 752; 48 U.S.C. 221.)

RECENT FISHERY PUBLICATIONS

Listed below are informational publications which recently have been processed by the Division of Commercial Fisheries. FL publications are available, free of charge, from the Fish and Wildlife Service, Merchandise Mart, Chicago 54, Ill. Other listed publications may be obtained, also free of charge, from the Division of Commercial Fisheries, Fish and Wildlife Service, Washington 25, D. C.

Number	Title
CFS-323 (Revised)	- Vitamin A Report, November 1946
CFS-324	- Vitamin A Report, December 1946
CFS-330	- Massachusetts Landings, January 1947
CFS-331	- Alaska Fisheries - 1945
CFS-332	- Pacific Coast Fisheries - 1944
CFS-333	- Fish Meal and Oil, February 1947
CFS-336	- Maine Landings, February 1947
CFS-337	- Vitamin A Report, January 1947
FL-214	- Fish Refrigeration
FL-220	- Glossary of Japanese Fisheries Terms
FL-227	- Fishing Industry of Ecuador
FL-228	- Fisheries in St. Lucia, British West Indies
FL-229	- Operation Fisheries in Japan
SL-6 (Revised)	- Wholesale Dealers in Fishery Products, New York, 1947
SL-17	- Wholesale Dealers in Fishery Products, Alabama, 1946
SL-18	- Wholesale Dealers in Fishery Products, Mississippi, 1946

Reprints (Separates) from Commercial Fisheries Review, April 1947.

Sep. No. 169 - Arrivals of Fishery Products at Seattle, 1946
Sep. No. 170 - Studies on Deterioration of Vitamin A in Fish Livers and Liver Oils - Part III - Loss at 37° C. of Vitamin A from Liver Oil in Presence and Absence of Grayfish Liver Tissue
Sep. No. 171 - Nutritive Value of Baked Croaker

Designations for fishery publications are interpreted as follows:

CFS - Current fishery statistics of the United States and Alaska.

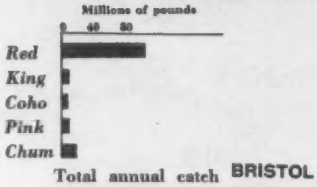
SL - Statistical lists, consisting of lists of dealers of fishery products and manufacturers of byproducts.

FL - Fishery leaflets.

MDL - Market development lists of frozen food locker plants and locker associations.

Editorial Assistant -- Bessie B. Johnston Compositors -- Jean Zalevsky and Norma C. Dressler
Illustrator -- Shirley A. Briggs Processing -- Miscellaneous Service Division

PACIFIC SALMON RESOURCES



Total annual catch
130 million pounds

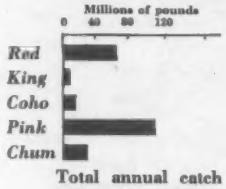
BRISTOL BAY

Japanese vessels fished in Bristol Bay from 1930 to 1941 for king crabs, bottom fish, and to some extent for salmon.

ALASKA

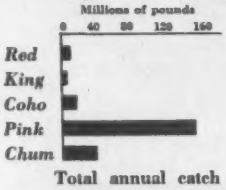
Purchased in 1867 for 7.2 million dollars

Value of Alaska salmon pack in 1943 57.8 million dollars



Total annual catch
195 million pounds

WESTERN ALASKA



Total annual catch
234 million pounds

SOUTHEASTERN ALASKA

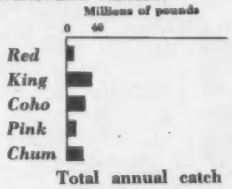
Total annual catch
167 million pounds

BRITISH COLUMBIA

SEATTLE

WASHINGTON

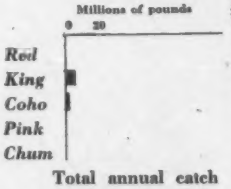
OREGON



Total annual catch
67 million pounds

PACIFIC NORTHWEST

Salmon



Total annual catch
5 million pounds

CALIFORNIA

CALIFORNIA

Salmon Fishing Grounds

Salmon Canneries

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILD LIFE SERVICE
WASHINGTON 25, D. C.

OFFICIAL BUSINESS
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Ann Arbor,
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CANNED FISHERY PRODUCTS
IN 1945, 360 CANNERIES LOCATED IN
THE UNITED STATES AND ALASKA PRODUCED
646 MILLION POUNDS OF CANNED FISH AND
SHELLFISH VALUED AT $152,800,571.
FOUR ITEMS ACCOUNTED FOR NEARLY
90 PERCENT OF THE TOTAL. THESE WERE
SALMON, SARDINES, TUNA, AND MACKEREL.
SALMON
Oyster
Sardines